OIPE JC67
OCT 12 2004
PATENT & TRADEMARK OFFICE

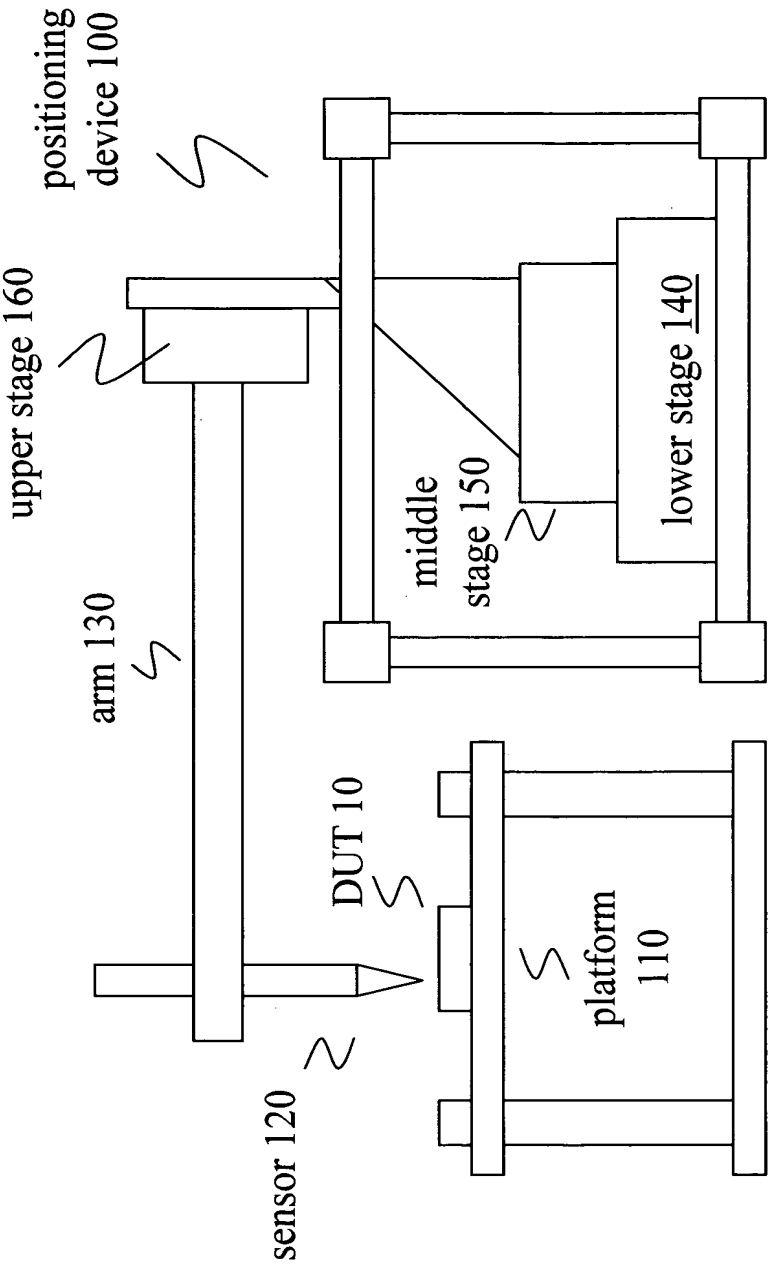


FIG. 1

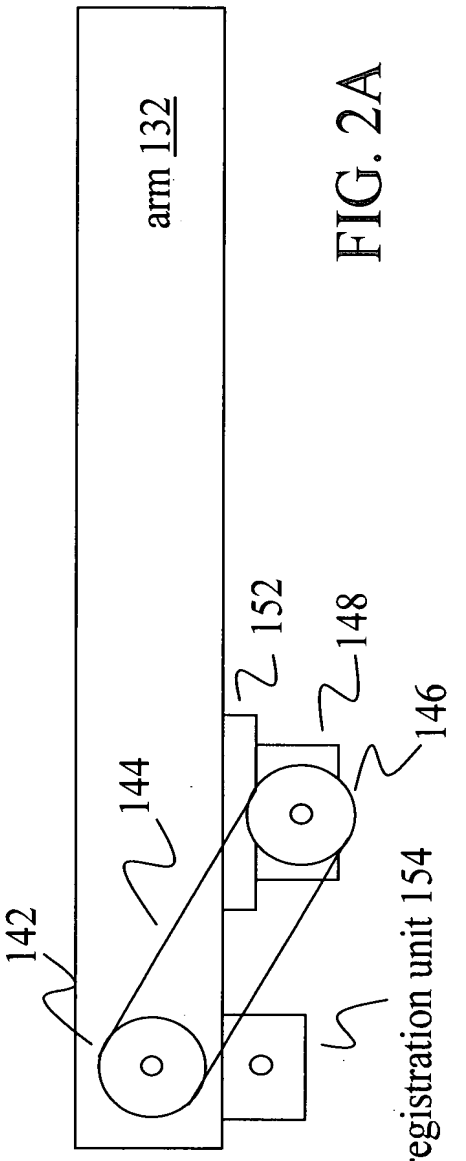

arm 132
142
144
152
148
146
registration unit 154

FIG. 2A

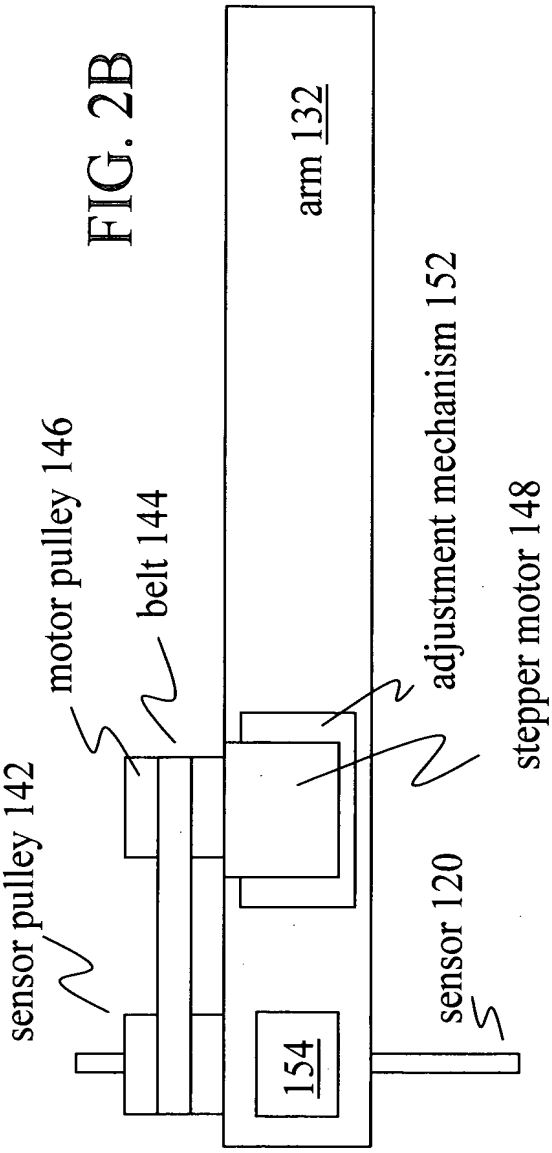

arm 132
sensor pulley 142
motor pulley 146
belt 144
adjustment mechanism 152
stepper motor 148
154
sensor 120

FIG. 2B

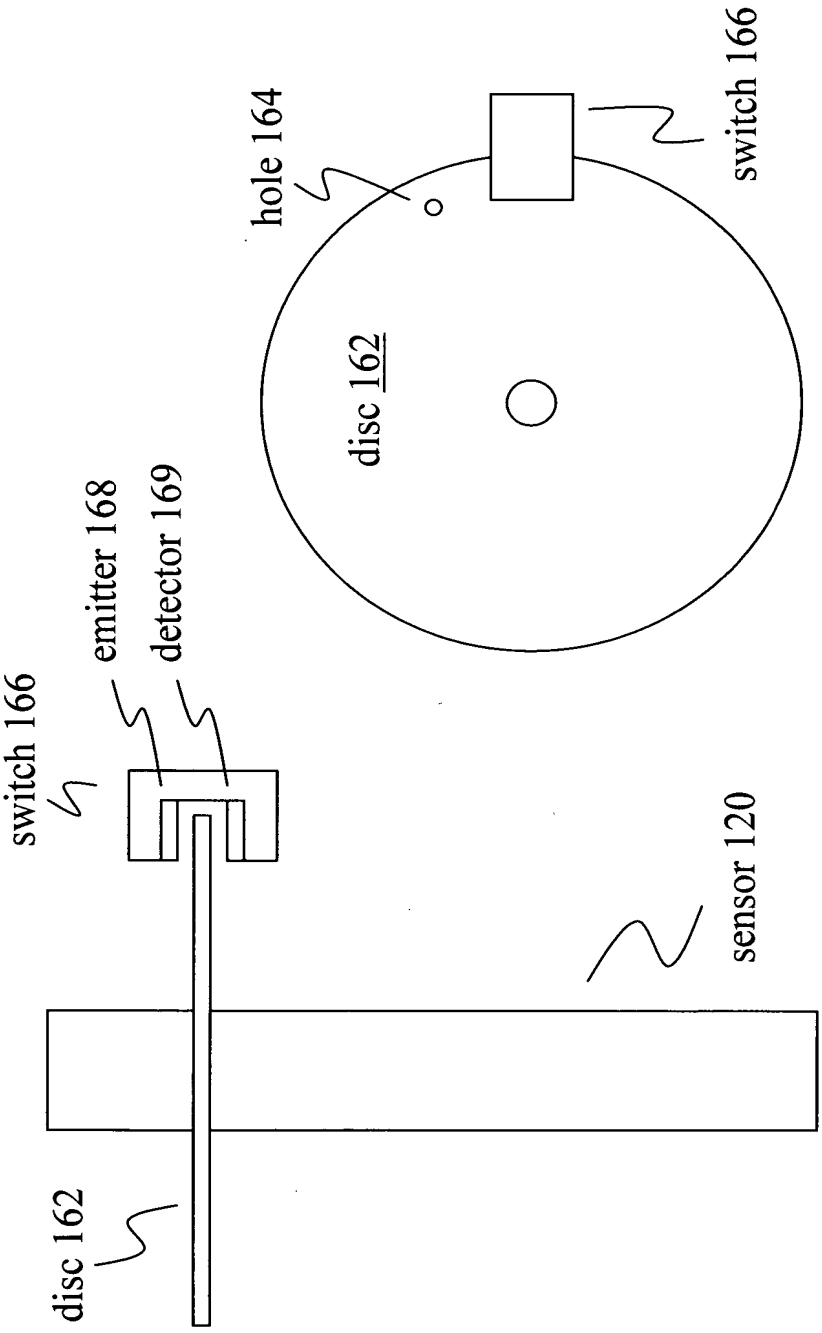

switch 166
emitter 168
detector 169
disc 162
sensor 120
hole 164
disc 162
switch 166

FIG. 3A

FIG. 3B

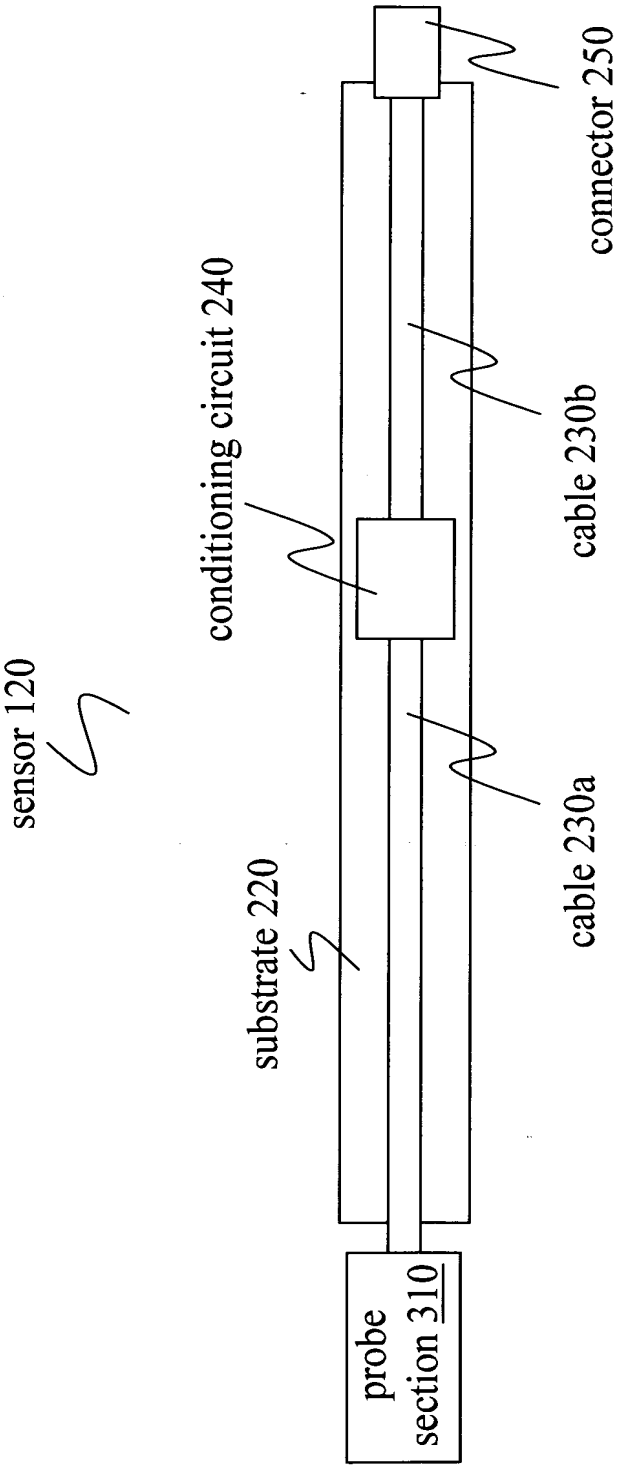

sensor 120
conditioning circuit 240
substrate 220
probe section 310
cable 230a
cable 230b
connector 250

FIG. 4

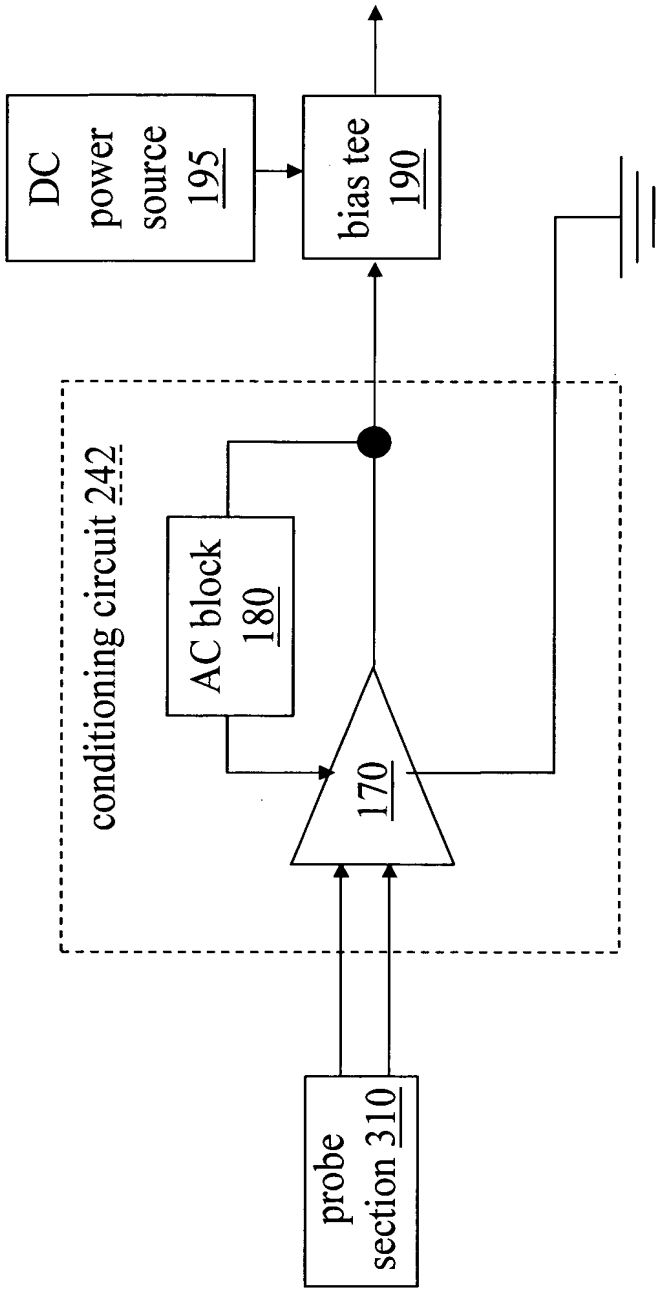

DC power source 195
bias tee 190
conditioning circuit 242
AC block 180
170
probe section 310

FIG. 5

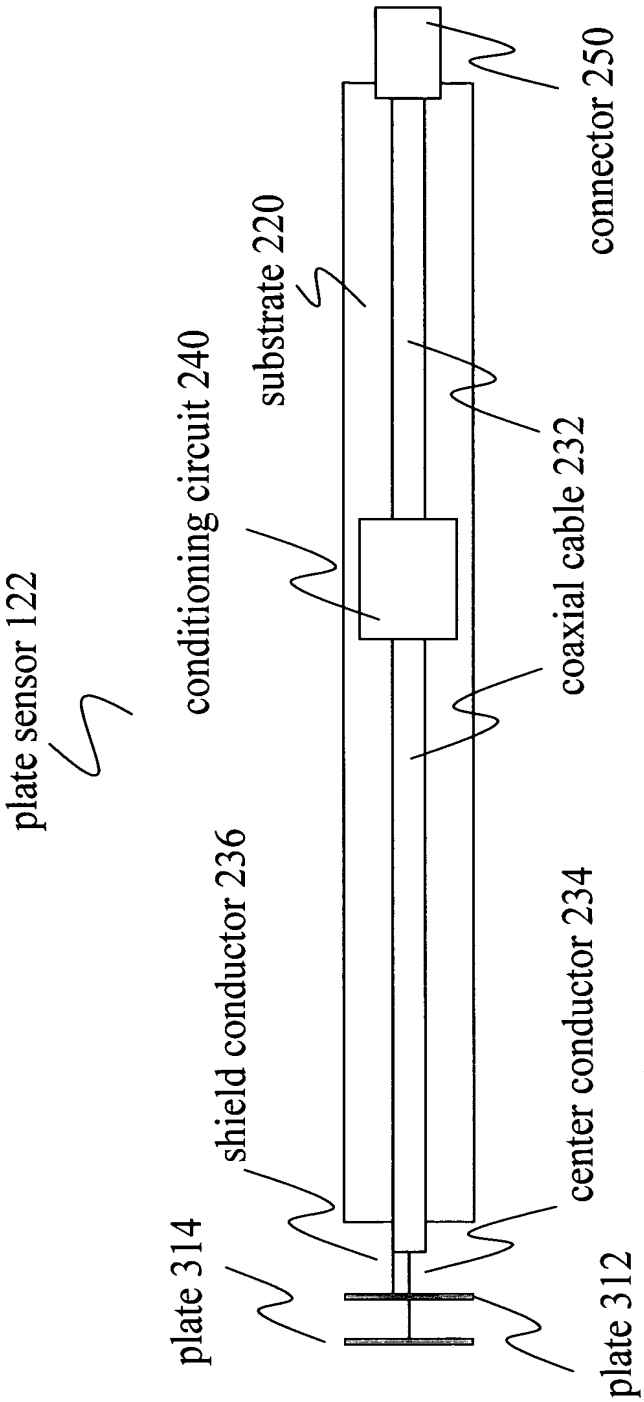


plate sensor 122
conditioning circuit 240
substrate 220
connector 250
coaxial cable 232
shield conductor 236
center conductor 234
plate 314
plate 312

FIG. 6

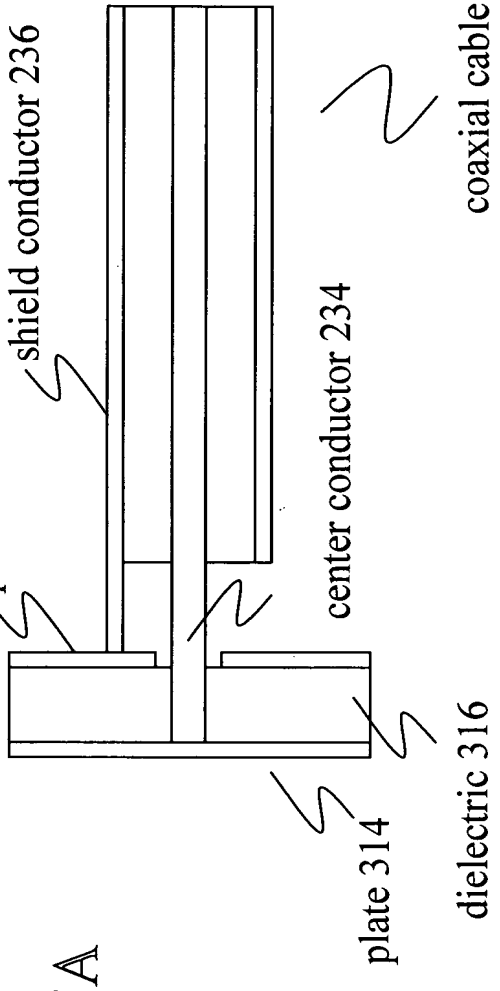


plate 312
shield conductor 236
center conductor 234
coaxial cable 232
plate 314
dielectric 316

FIG. 7A

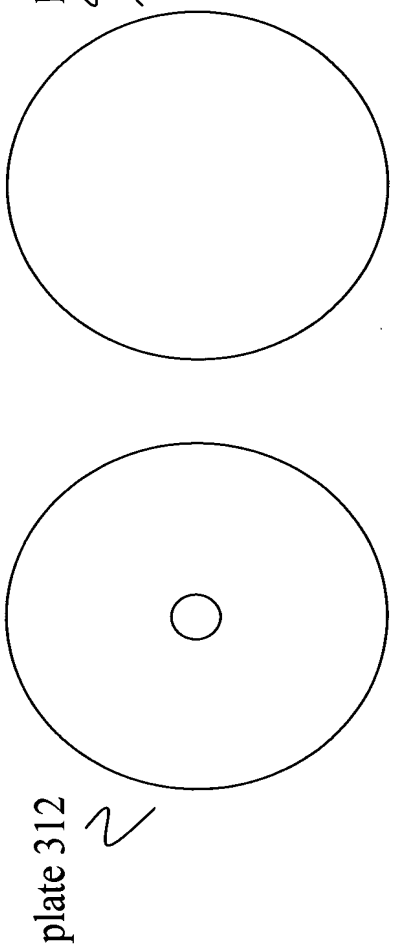


plate 314
plate 312

FIG. 7B

FIG. 8

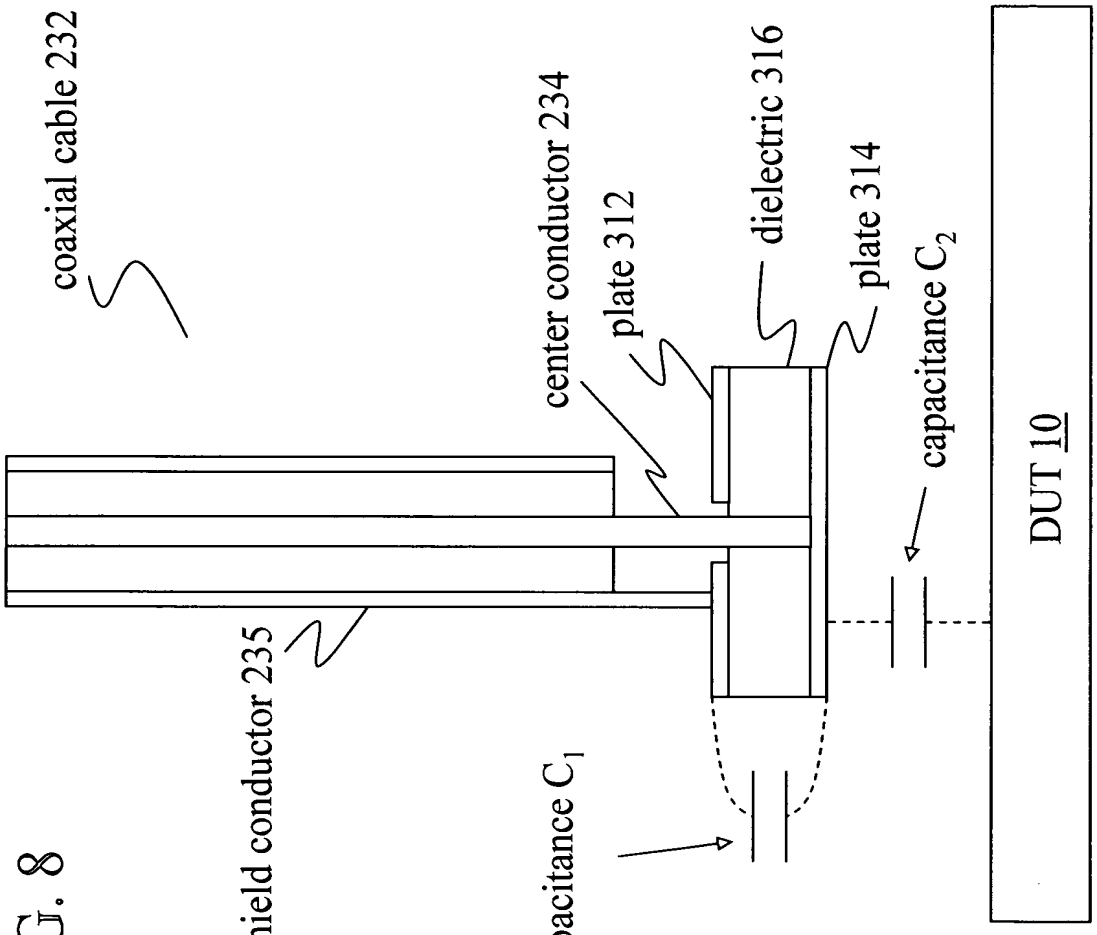

coaxial cable 232
center conductor 234
plate 312
dielectric 316
plate 314
capacitance C_2
DUT 10
shield conductor 235
capacitance C_1

FIG. 9A

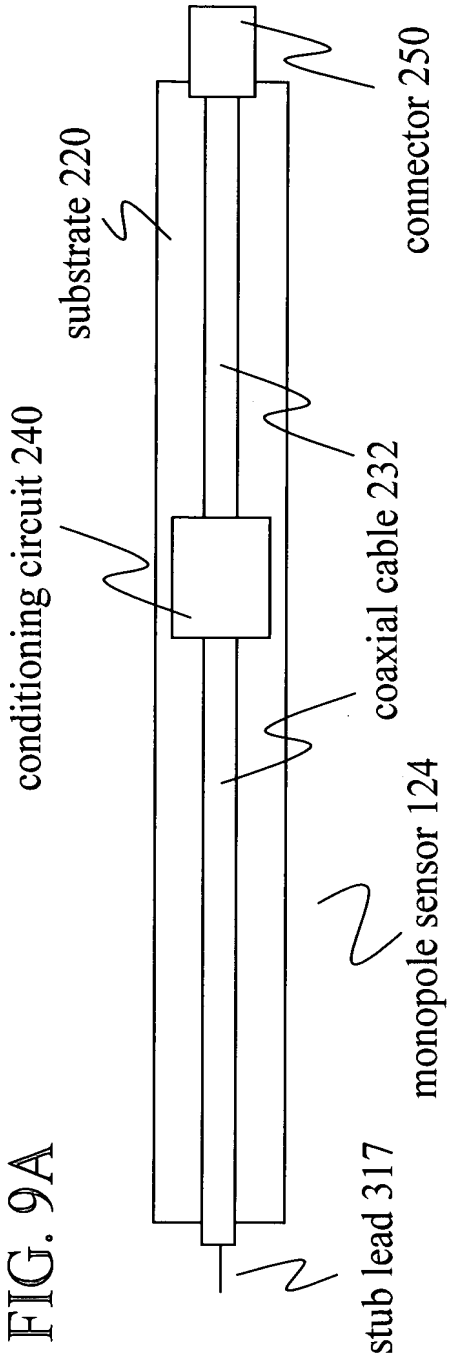
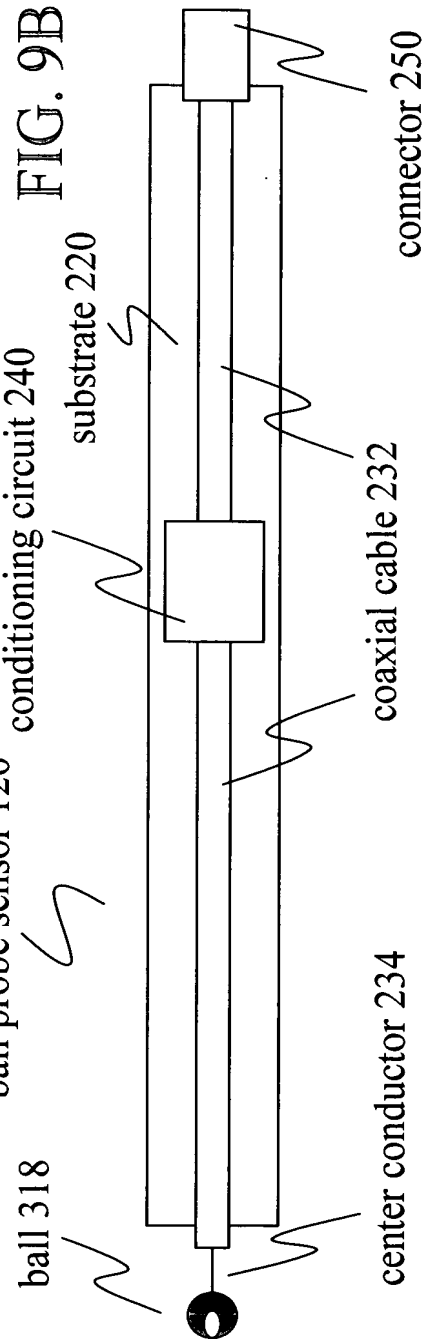

conditioning circuit 240
substrate 220
connector 250
coaxial cable 232
monopole sensor 124
stub lead 317

FIG. 9B


ball probe sensor 126
conditioning circuit 240
substrate 220
connector 250
coaxial cable 232
ball 318
center conductor 234

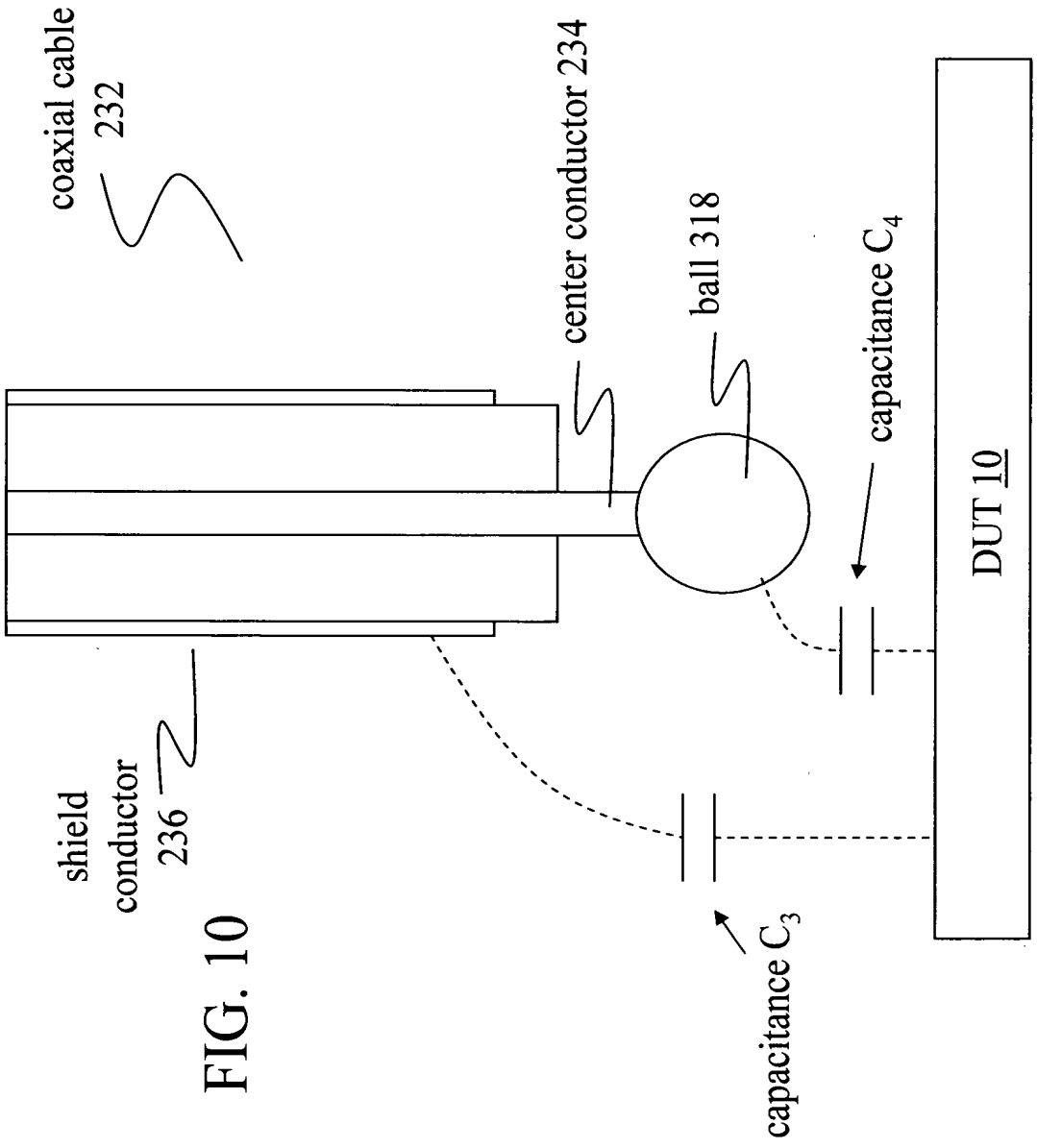

coaxial cable
232
center conductor 234
ball 318
capacitance C_4
DUT 10
shield
conductor
236
capacitance C_3

FIG. 10

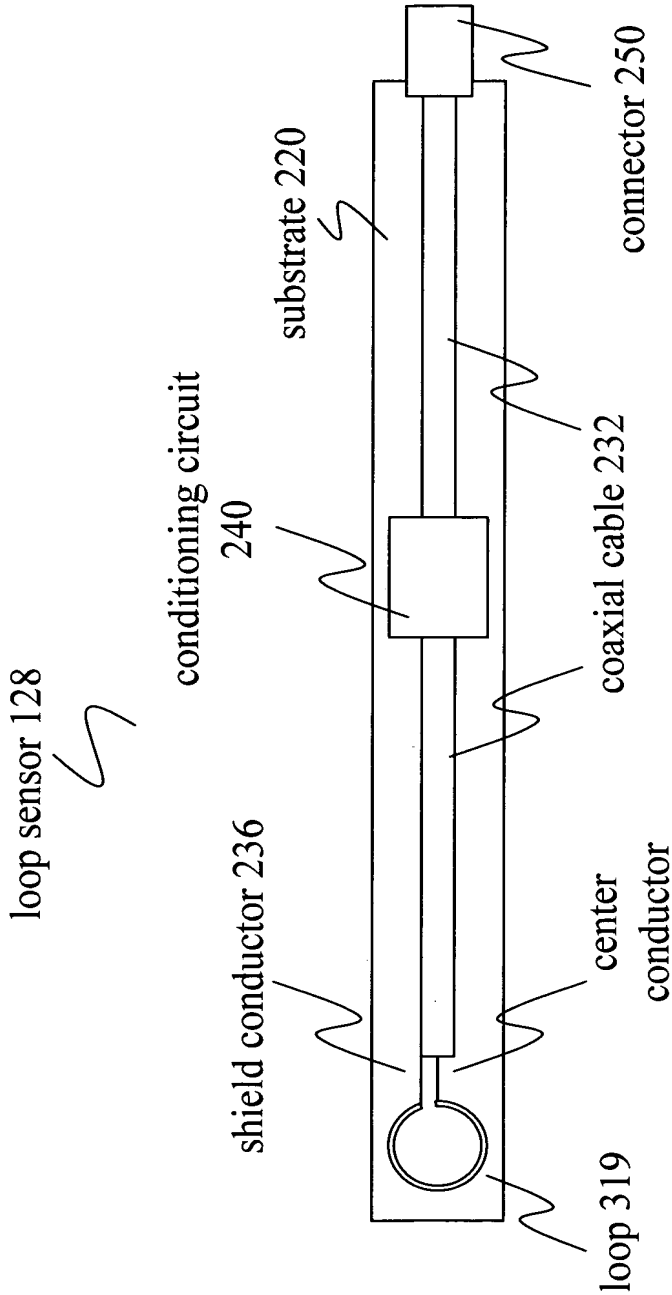

loop sensor 128
conditioning circuit 240
substrate 220
connector 250
coaxial cable 232
shield conductor 236
center conductor 234
loop 319

FIG. 11

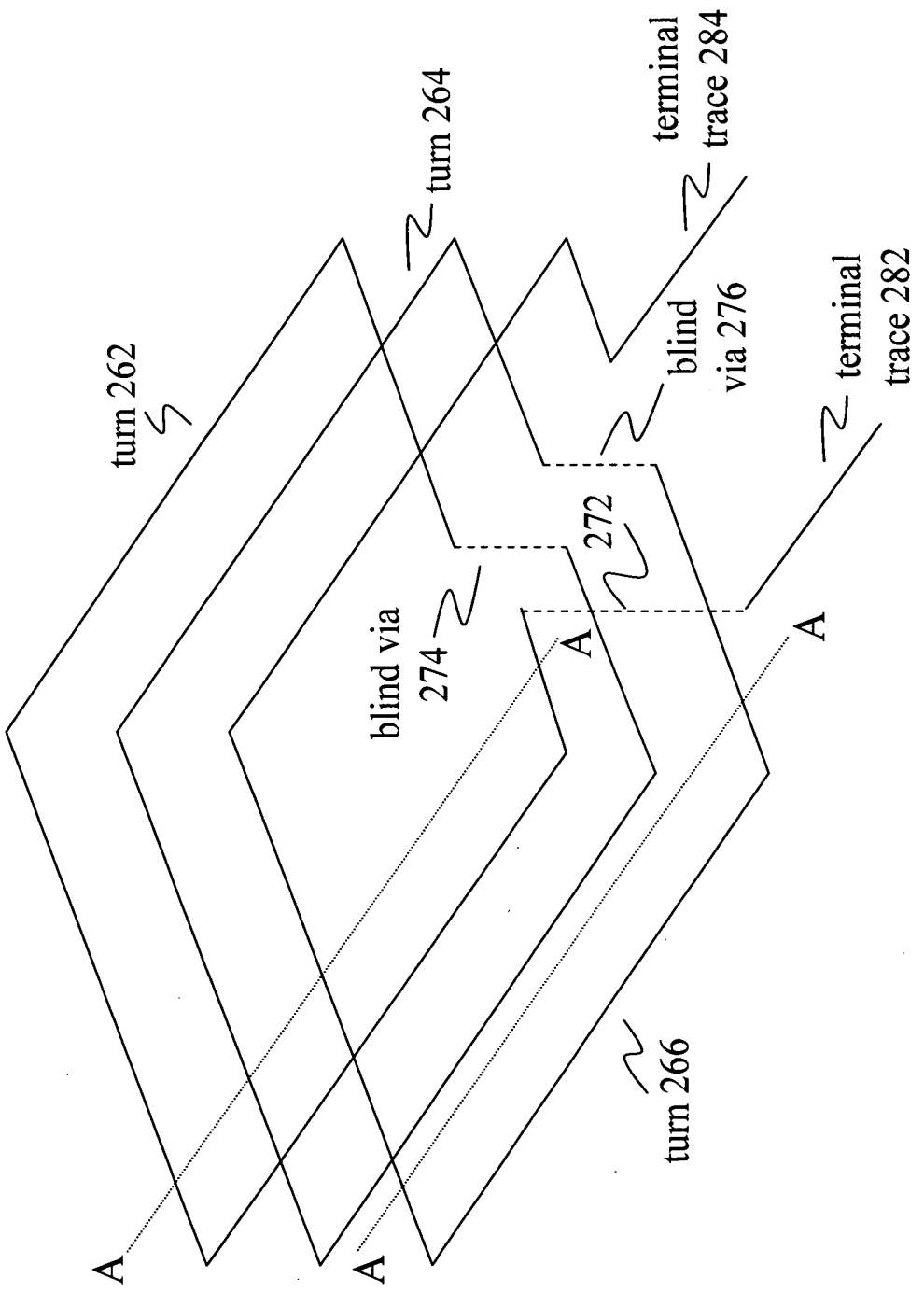

turn 262
turn 264
terminal trace 284
blind via 276
terminal trace 282
blind via 274
272
turn 266
A
A
A
A

FIG. 12

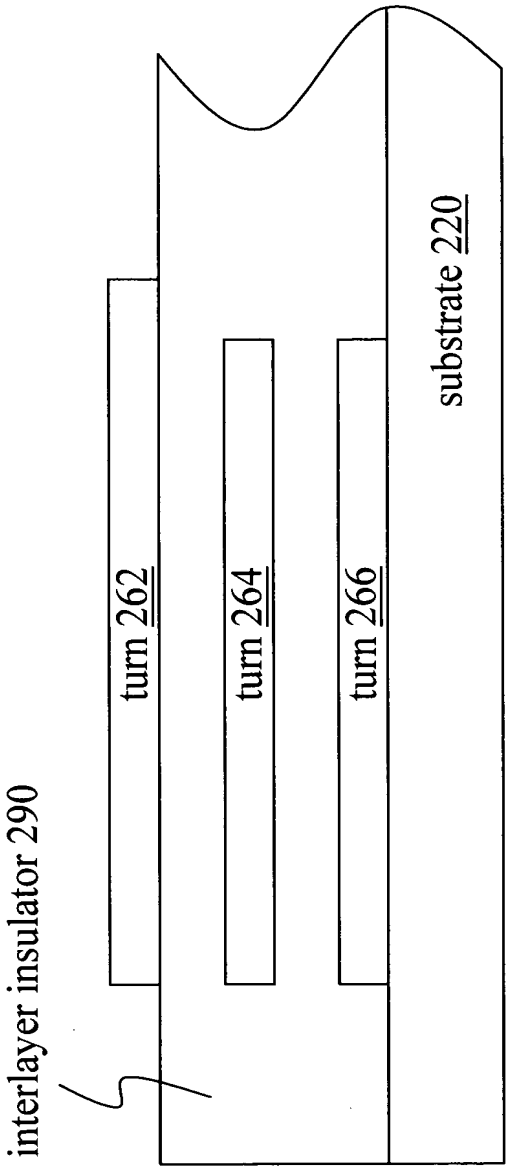

interlayer insulator 290
turn 262
turn 264
turn 266
substrate 220

FIG. 13

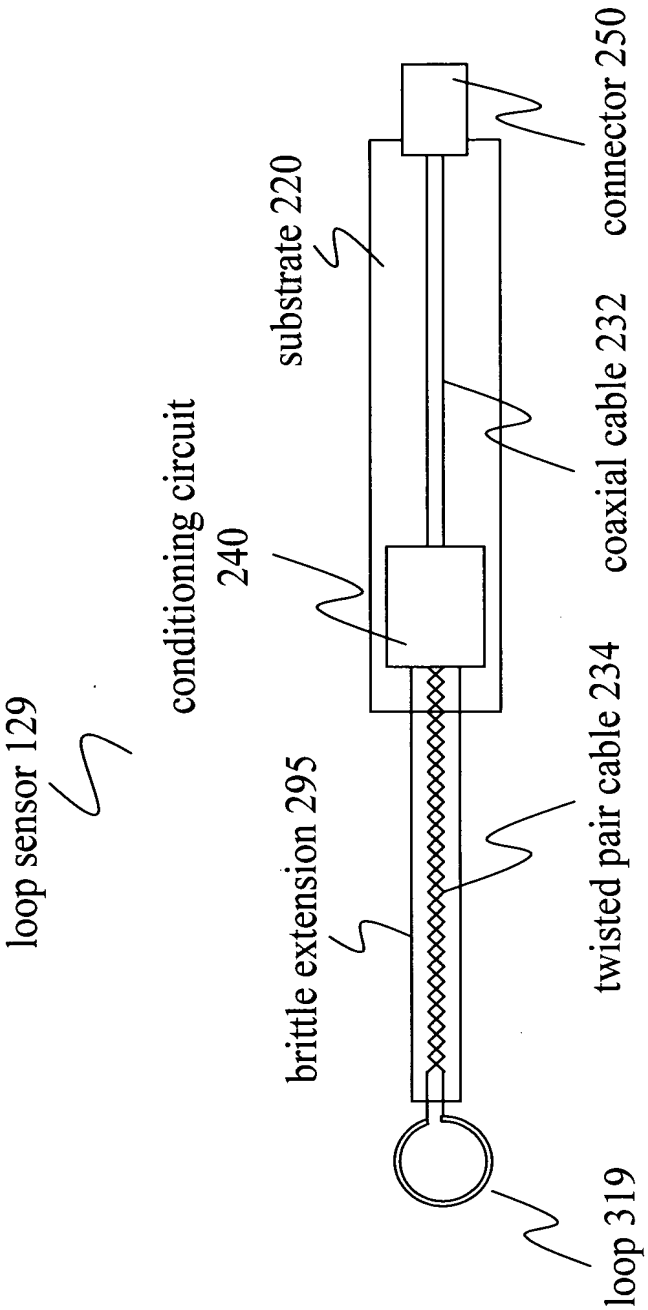

loop sensor 129
conditioning circuit 240
substrate 220
connector 250
brittle extension 295
coaxial cable 232
twisted pair cable 234
loop 319

FIG. 14

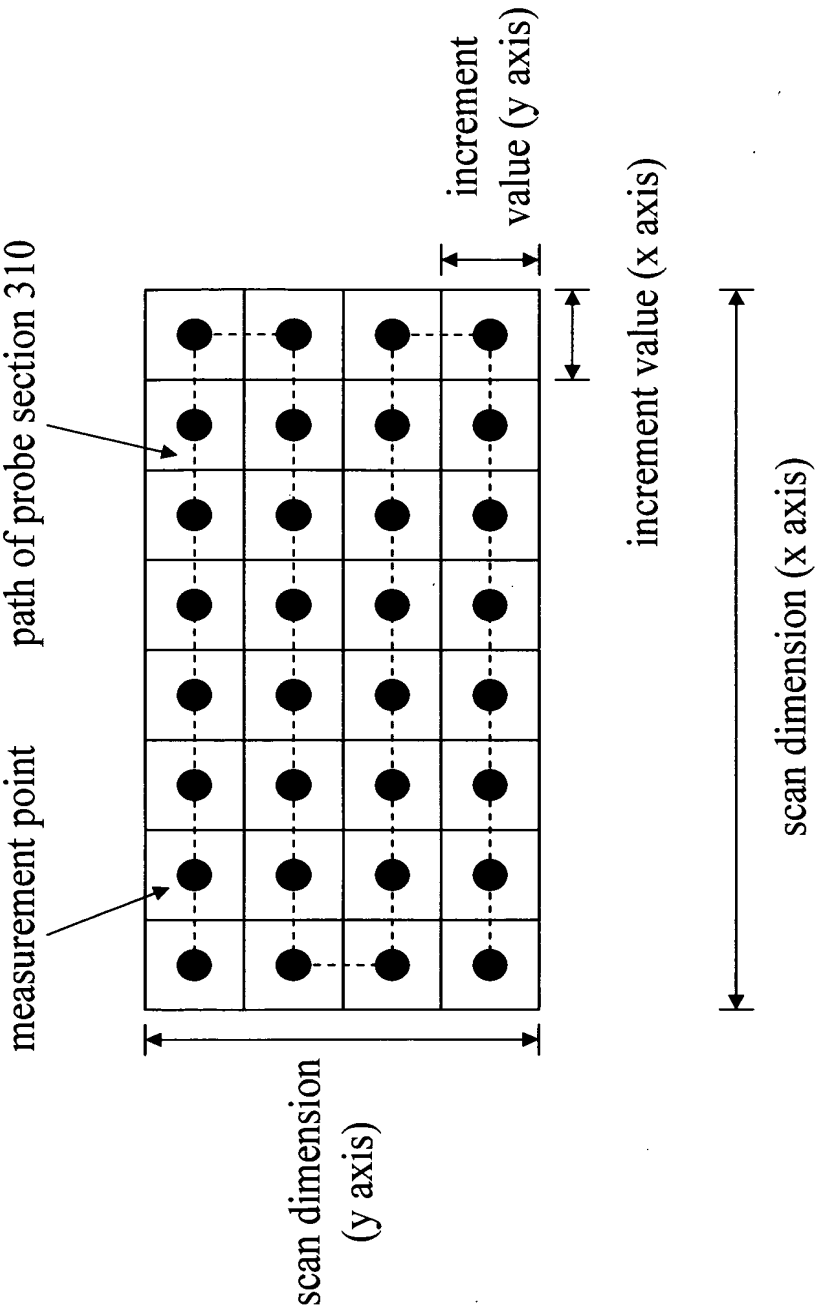

measurement point
path of probe section 310
increment value (y axis)
increment value (x axis)
scan dimension (y axis)
scan dimension (x axis)

FIG. 15

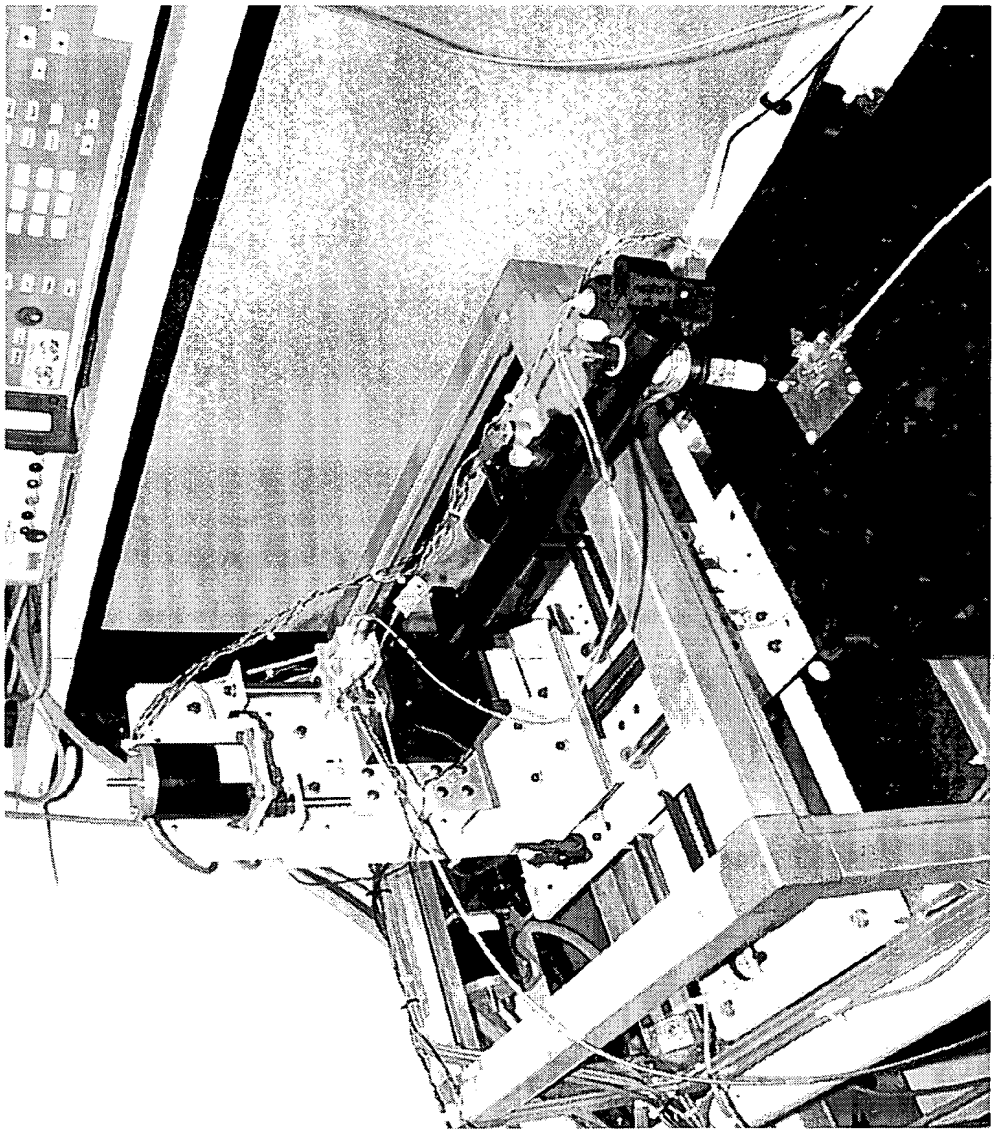


FIG. 16

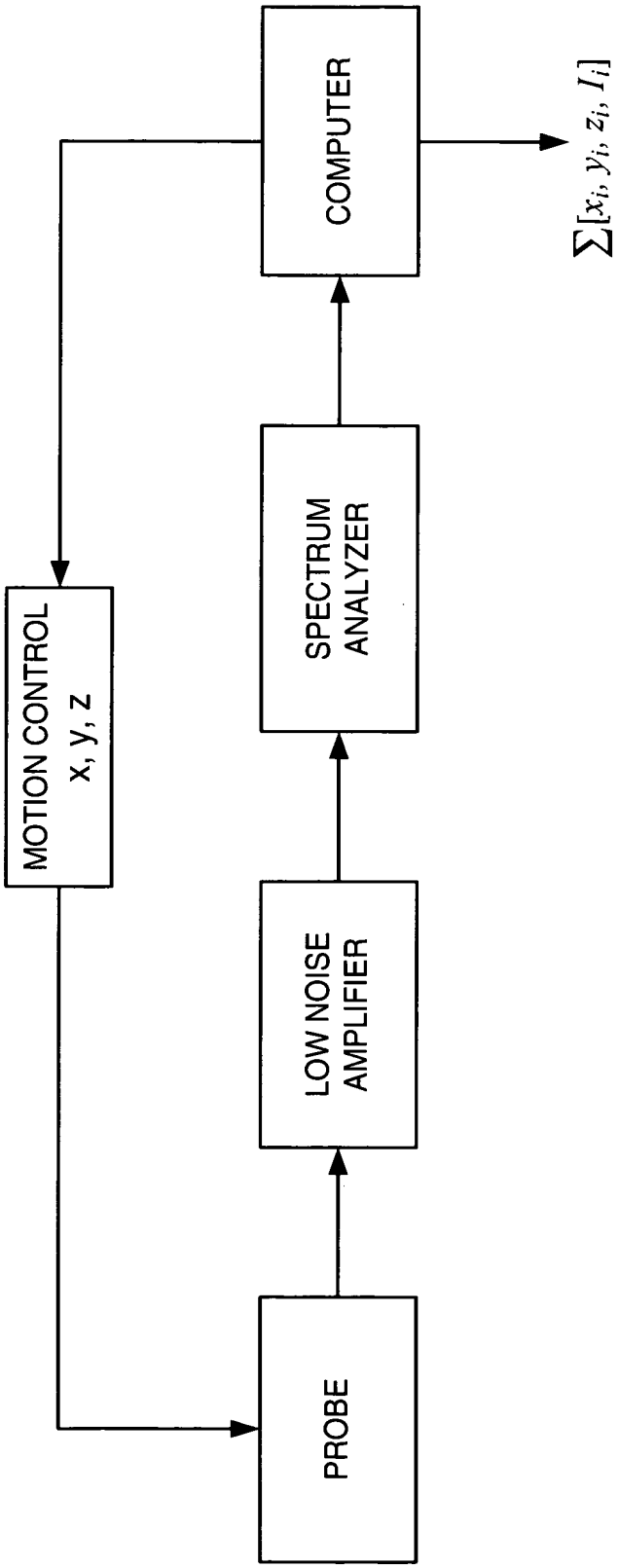

COMPUTER
$\sum[x_i, y_i, z_i, I_i]$
SPECTRUM ANALYZER
LOW NOISE AMPLIFIER
MOTION CONTROL x, y, z
PROBE

FIG. 17

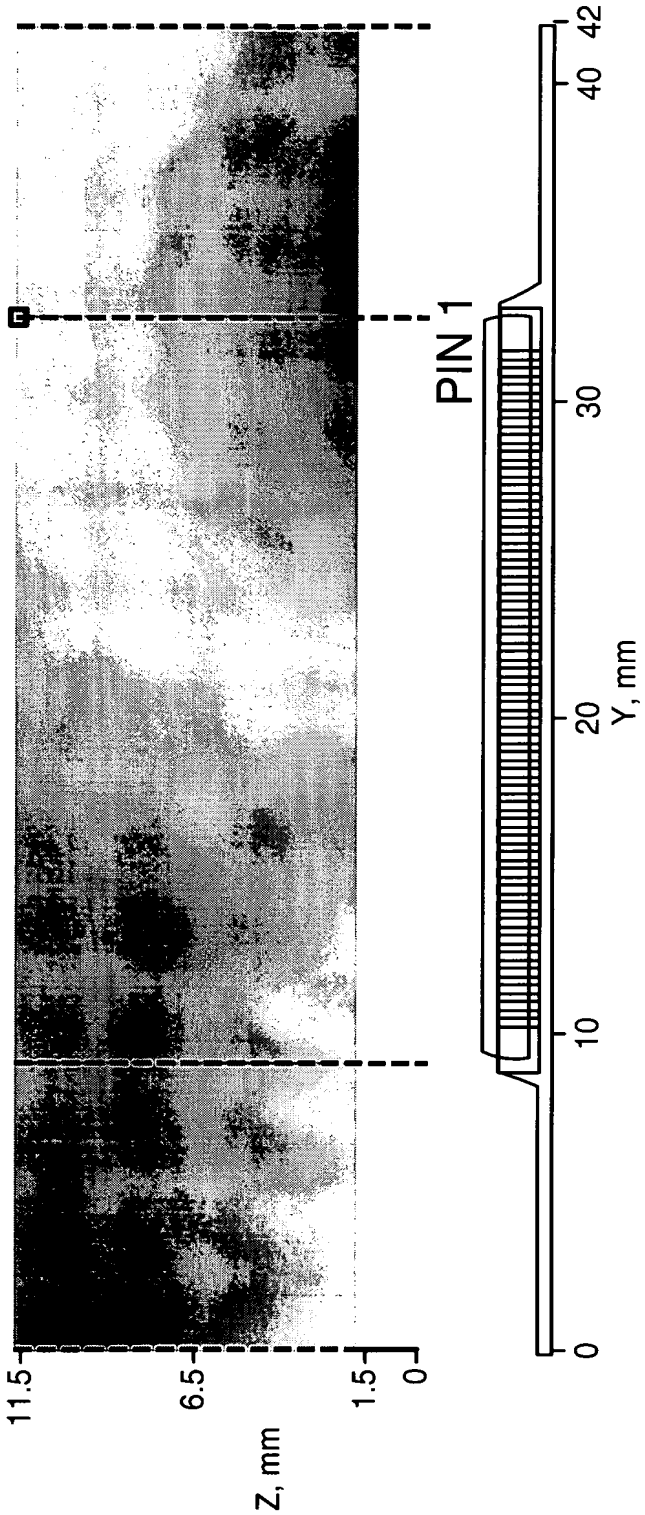


FIG. 18

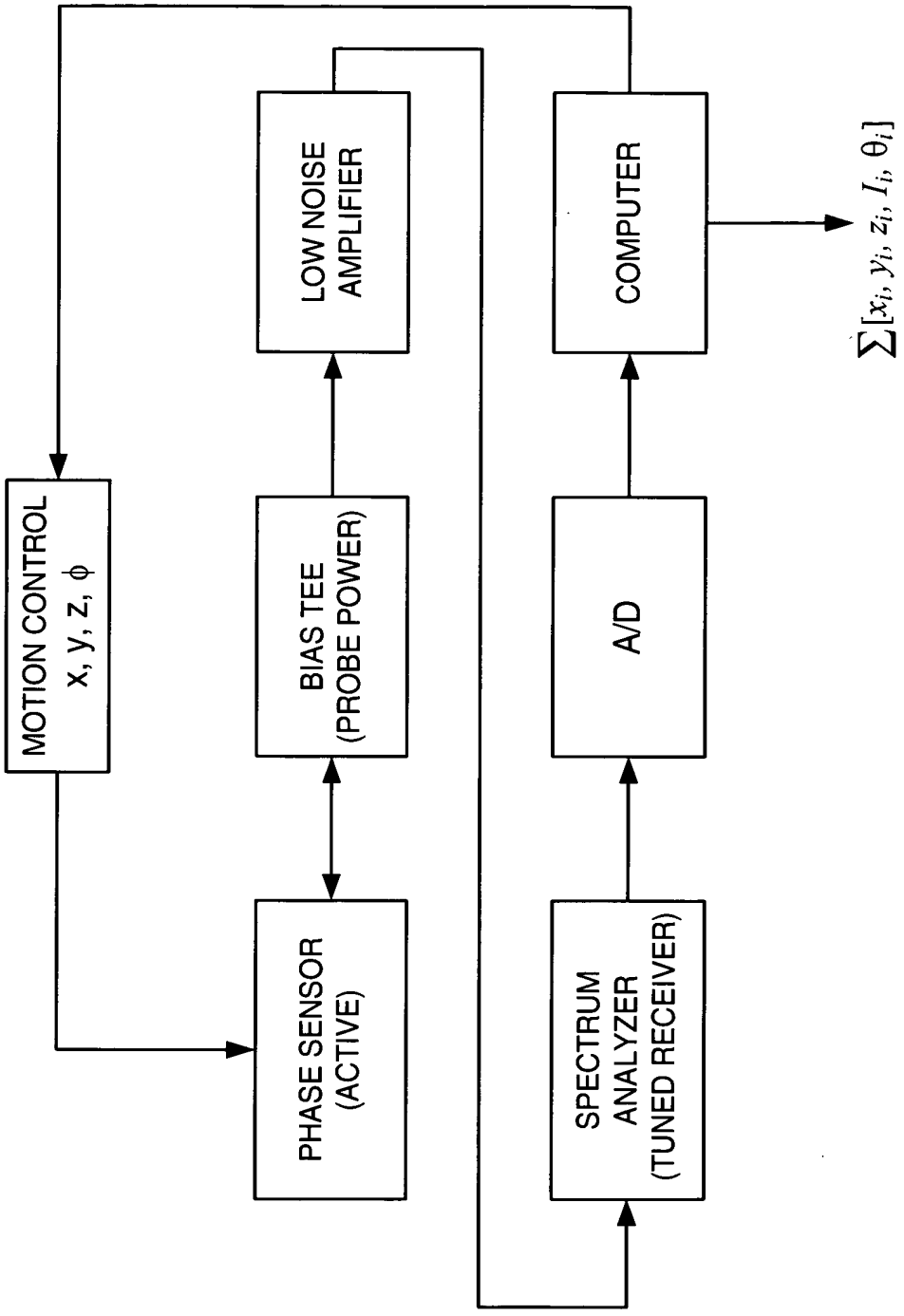

MOTION CONTROL
x, y, z, ϕ
PHASE SENSOR
(ACTIVE)
BIAS TEE
(PROBE POWER)
LOW NOISE
AMPLIFIER
SPECTRUM
ANALYZER
(TUNED RECEIVER)
A/D
COMPUTER
$\sum[x_i, y_i, z_i, I_i, \theta_i]$

FIG. 19

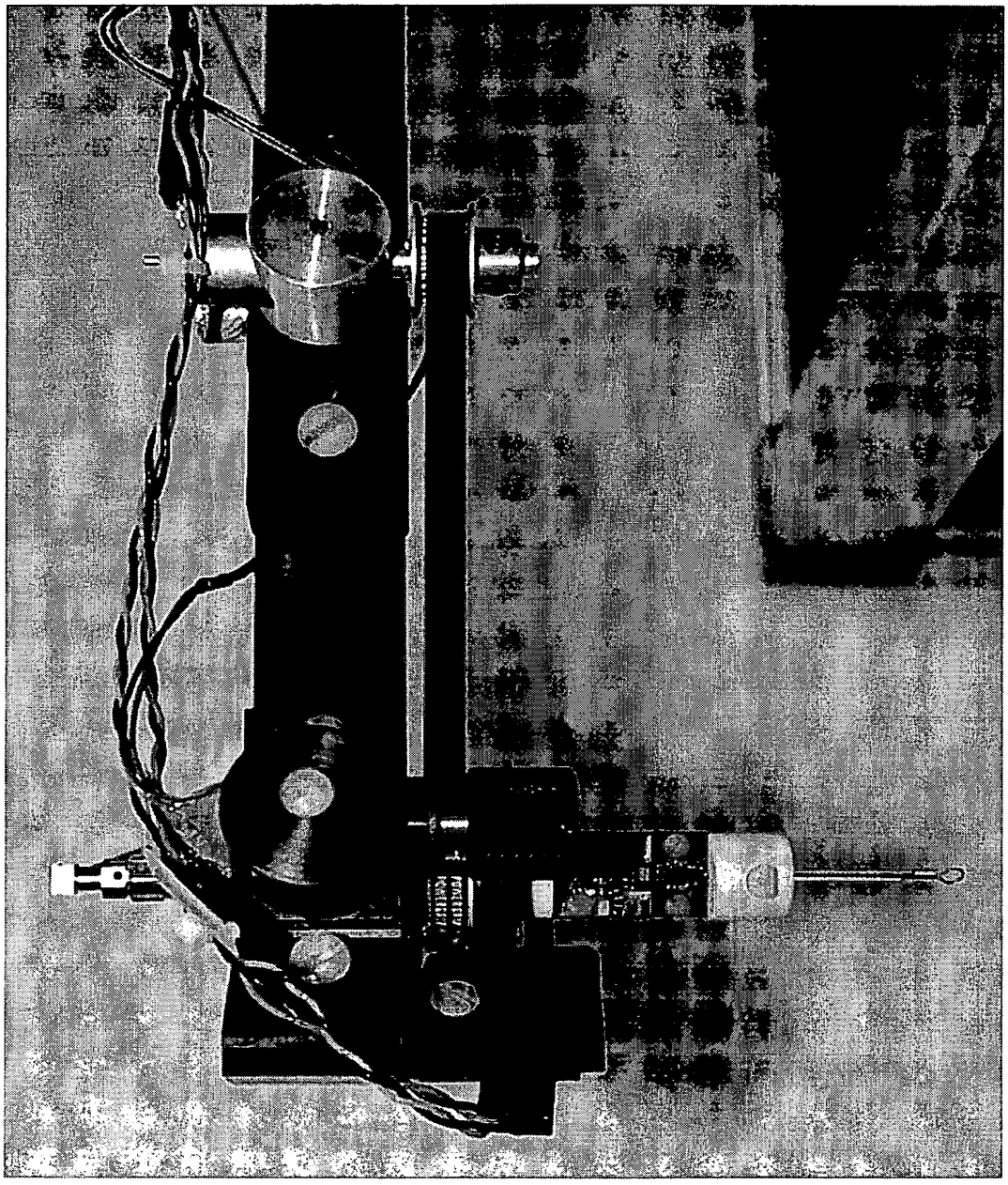


FIG. 20

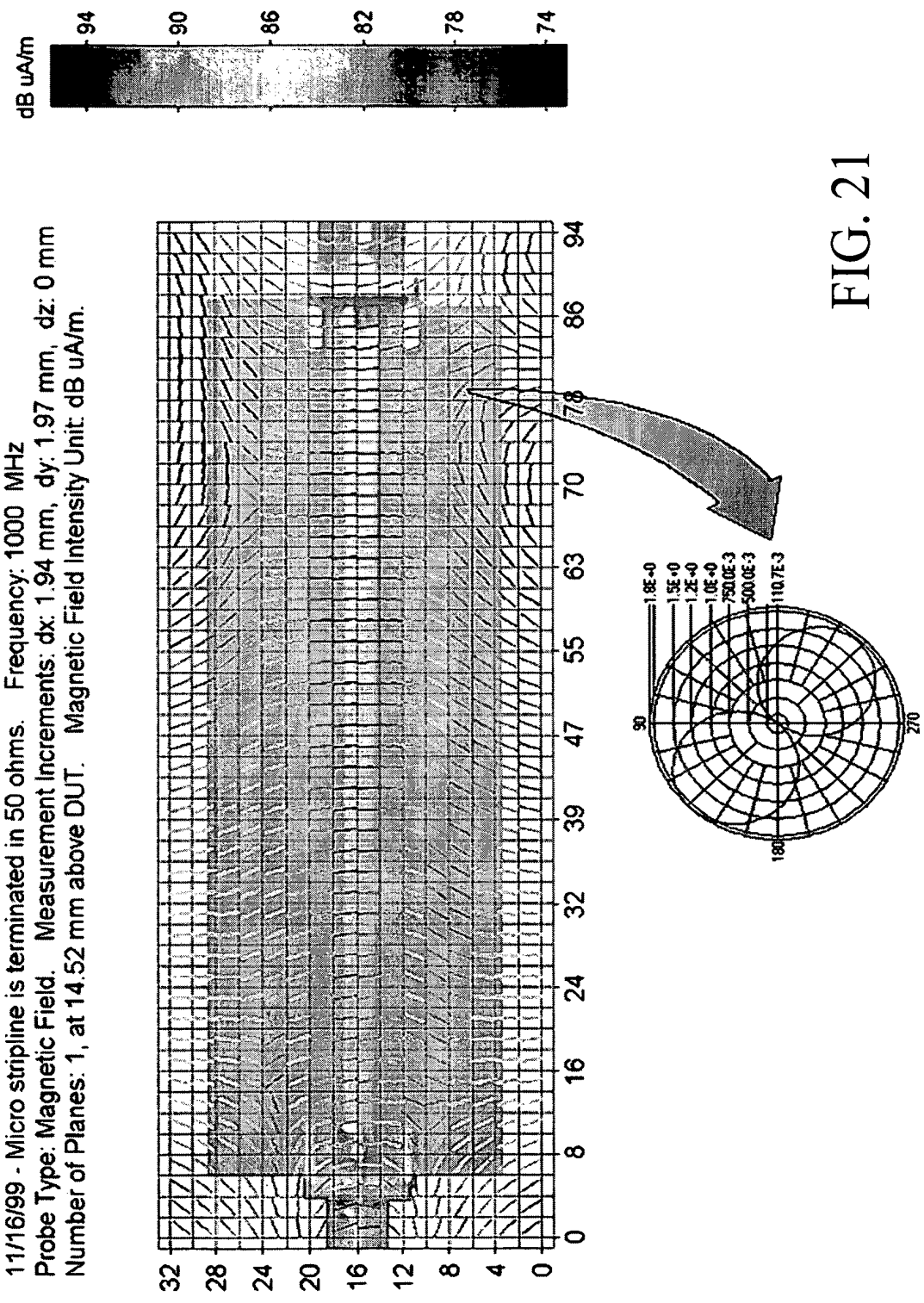

11/16/99 - Micro stripline is terminated in 50 ohms. Frequency: 1000 MHz
Probe Type: Magnetic Field. Measurement Increments: dx: 1.94 mm, dy: 1.97 mm, dz: 0 mm
Number of Planes: 1, at 14.52 mm above DUT. Magnetic Field Intensity Unit: dB uA/m.
dB uA/m
94
90
86
82
78
74
32
28
24
20
16
12
8
4
0
0
8
16
24
32
39
47
55
63
70
78
86
94
90
270
180
1.8E-0
1.5E-0
1.2E-0
1.0E-0
750.0E-3
500.0E-3
110.7E-3

FIG. 21

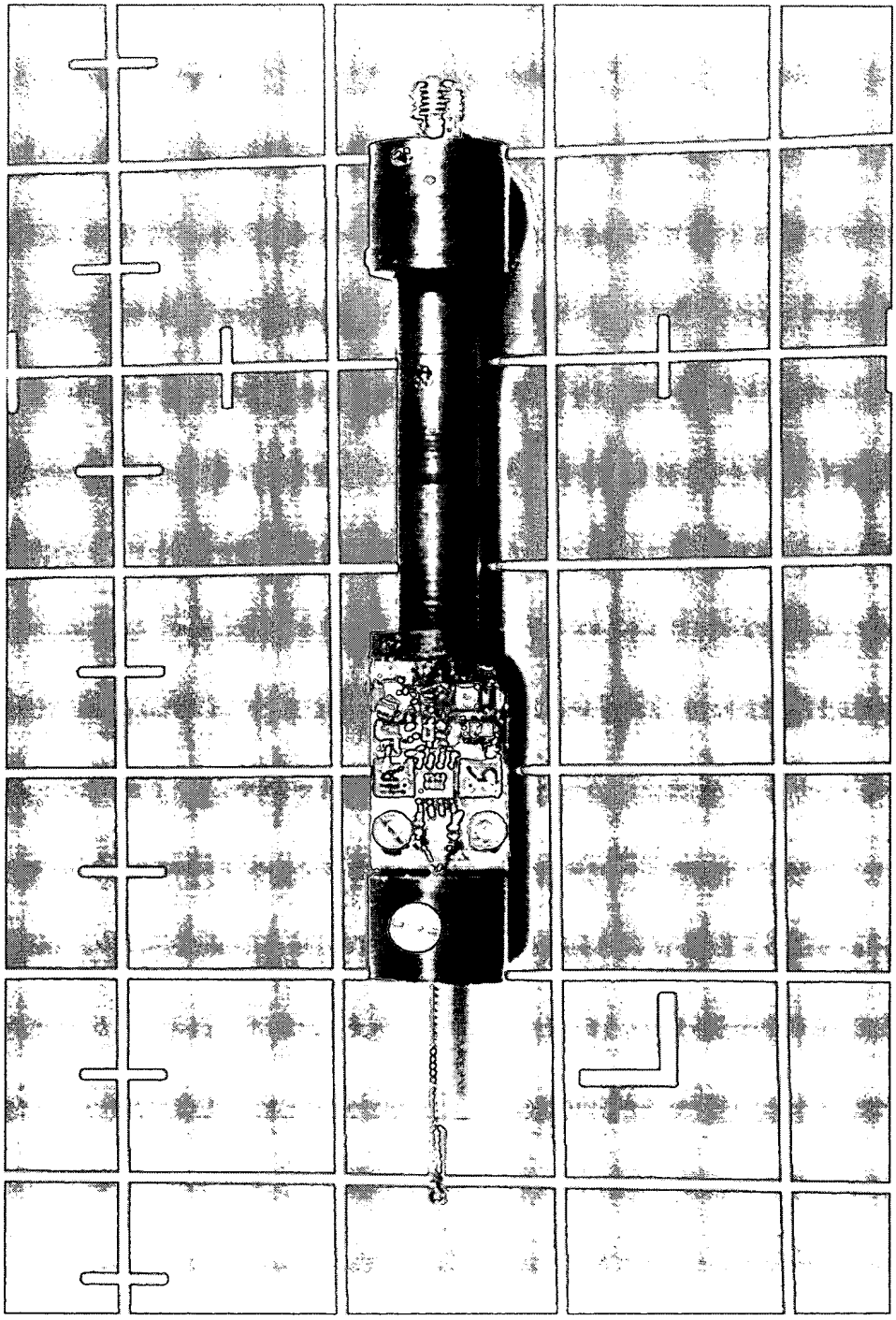


FIG. 22

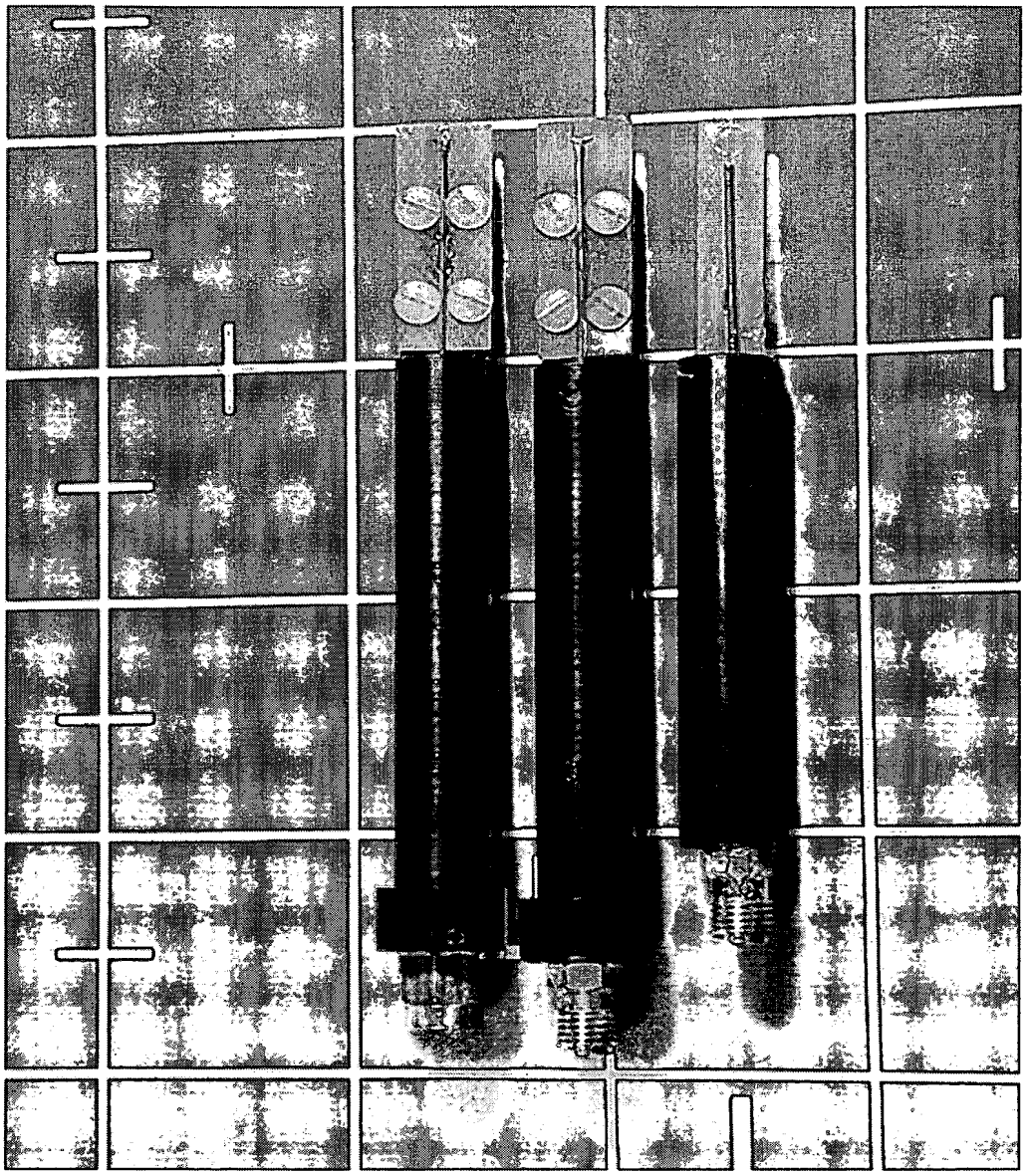


FIG. 23

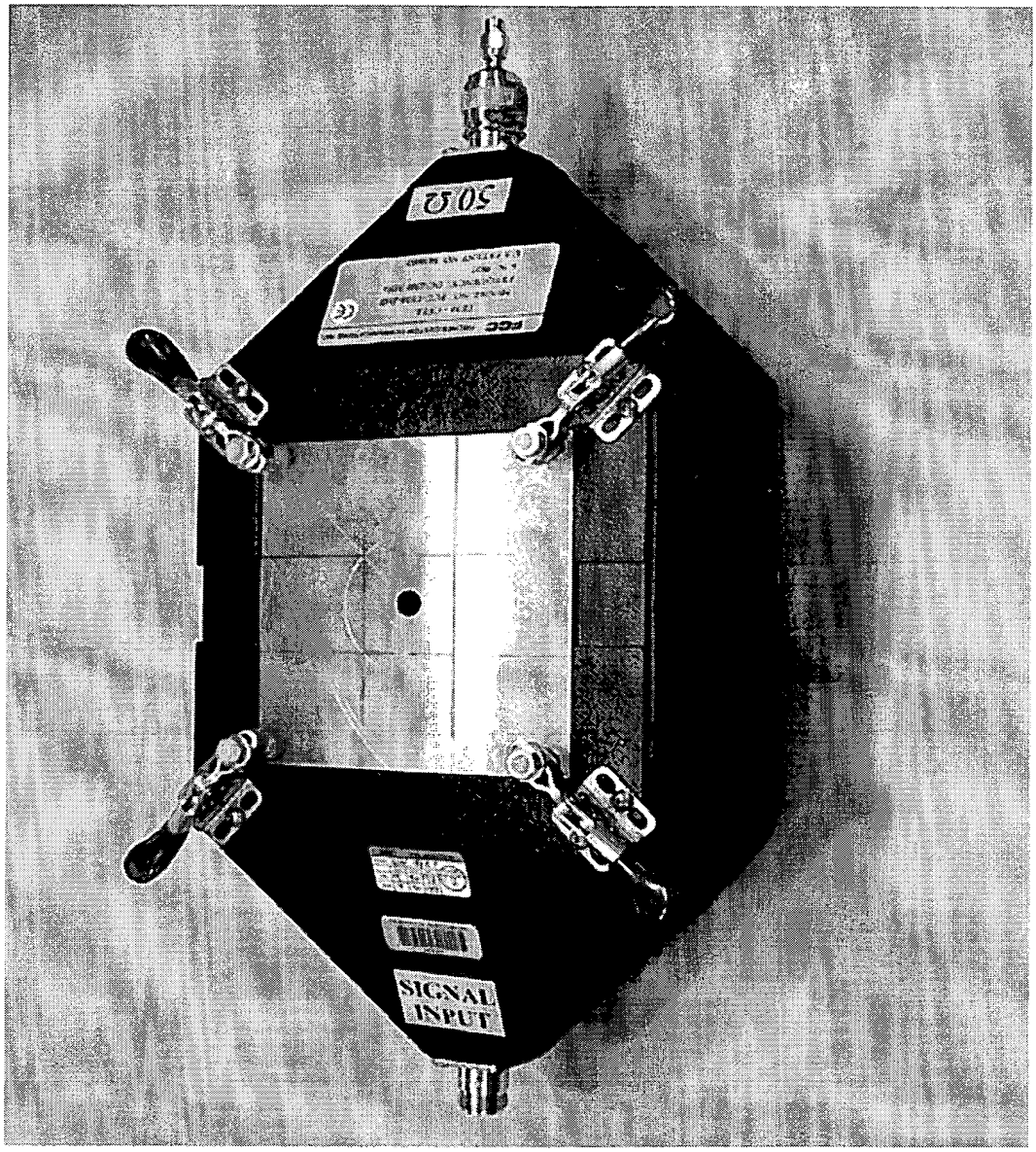


FIG. 24

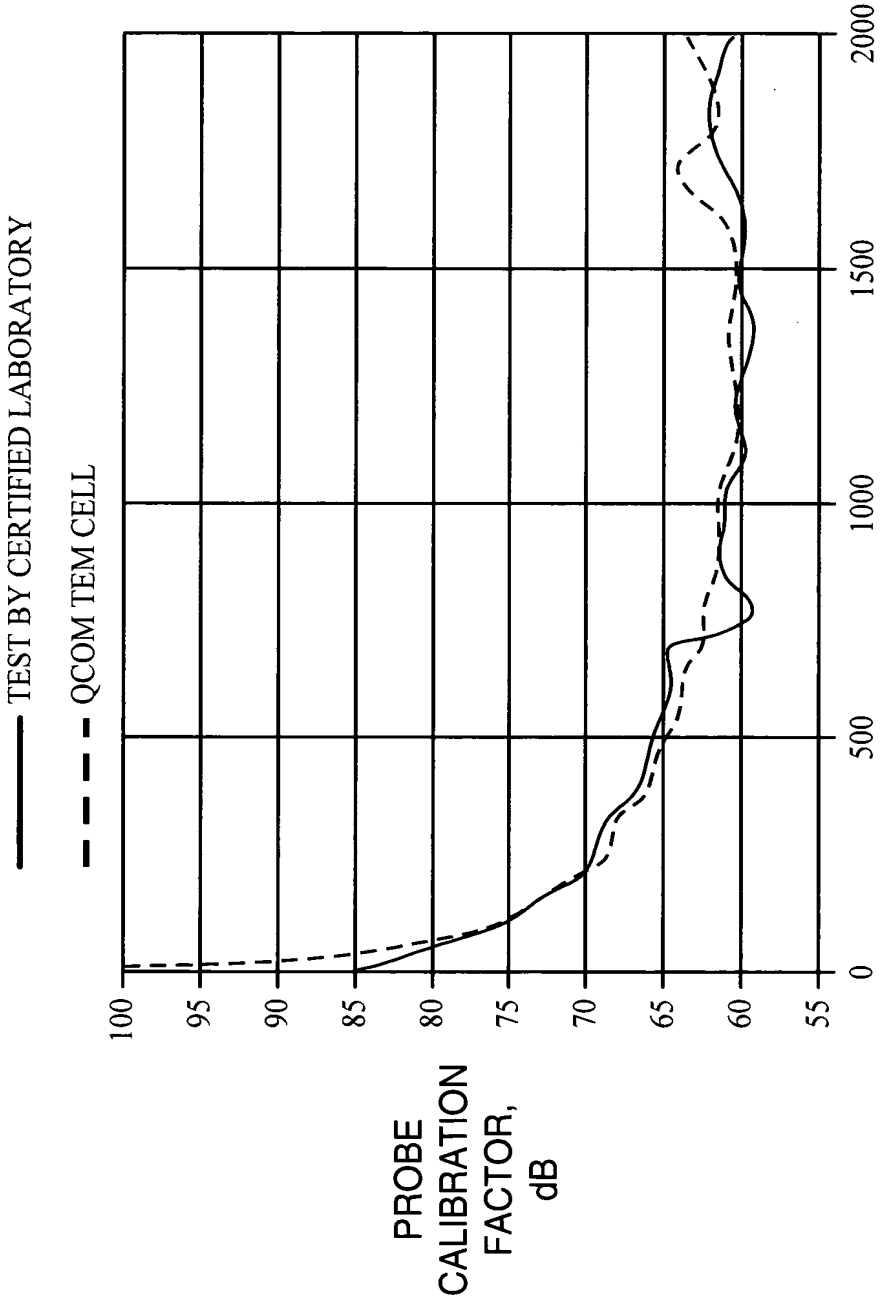

TEST BY CERTIFIED LABORATORY
QCOM TEM CELL
PROBE CALIBRATION FACTOR, dB
100
95
90
85
80
75
70
65
60
55
0
500
1000
1500
2000
FREQUENCY

FIG. 25

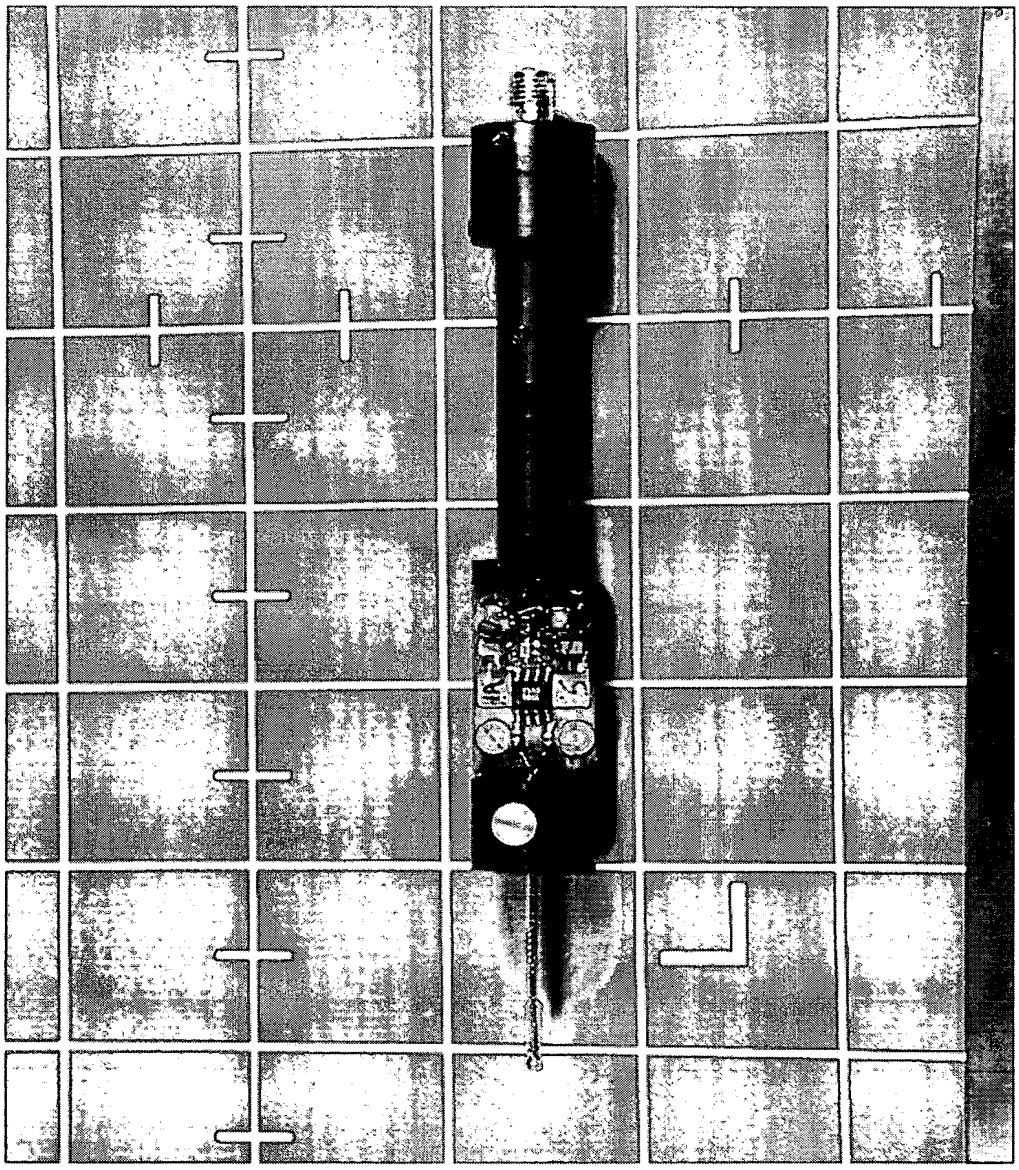


FIG. 26

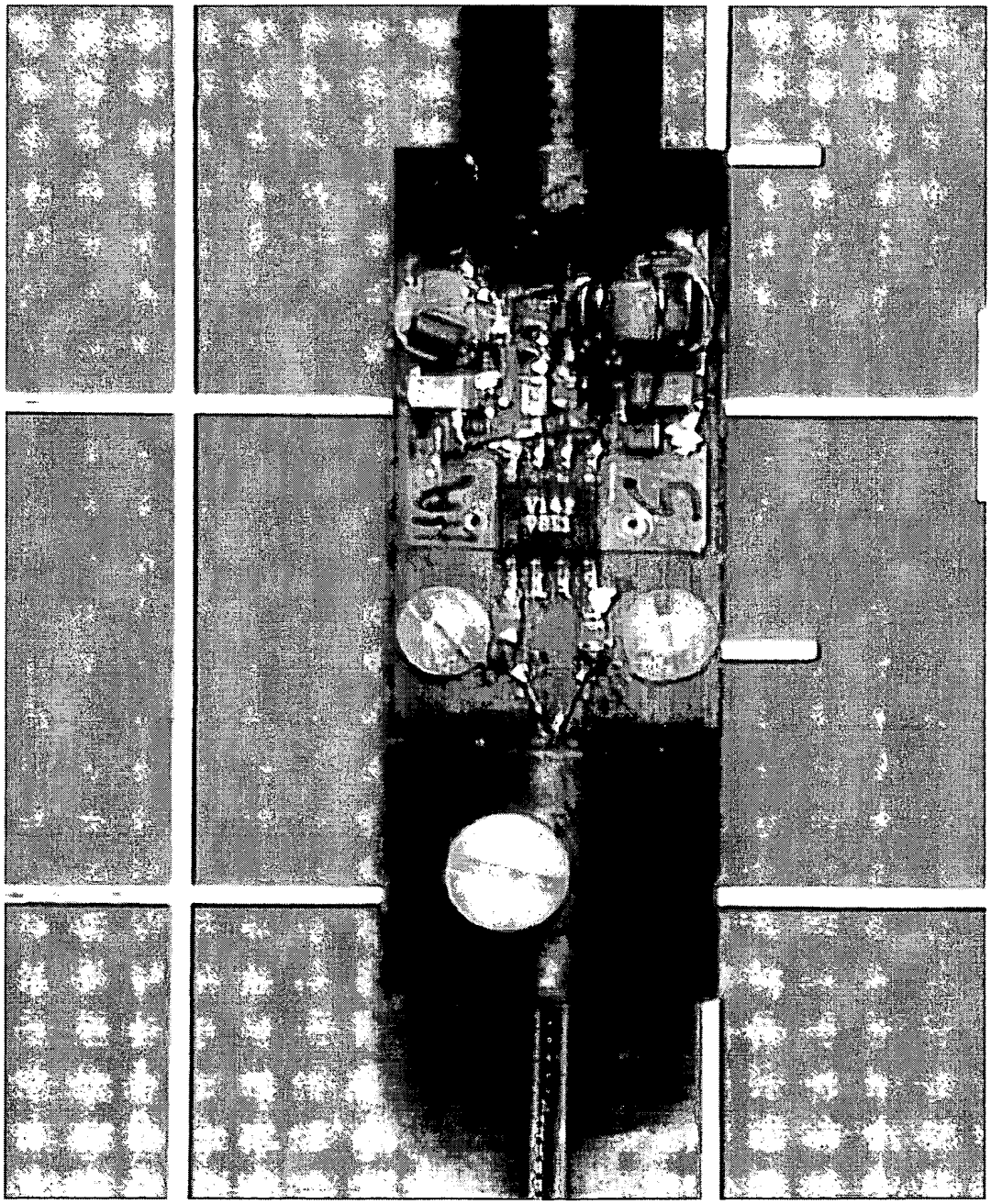


FIG. 27

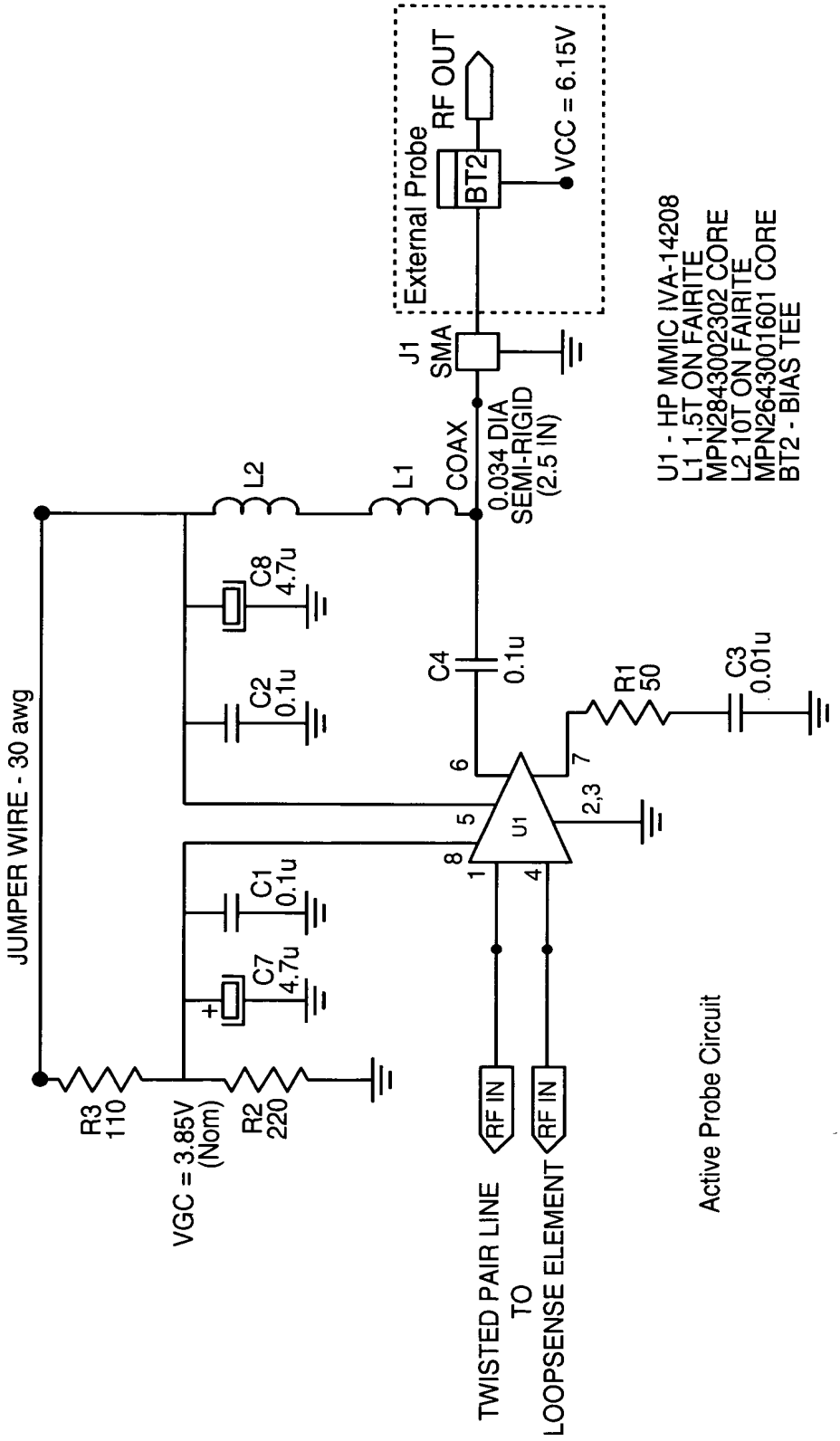

External Probe
RF OUT
BT2
VCC = 6.15V
J1
SMA
0.034 DIA
SEMI-RIGID
(2.5 IN)
COAX
L1
L2
U1 - HP MMIC IVA-14208
L1 1.5T ON FAIRITE
MPN2843002302 CORE
L2 10T ON FAIRITE
MPN2643001601 CORE
BT2 - BIAS TEE
JUMPER WIRE - 30 awg
C8
4.7u
C2
0.1u
C4
0.1u
R1
50
C3
0.01u
U1
C1
0.1u
C7
4.7u
R3
110
VGC = 3.85V
(Nom)
R2
220
RF IN
RF IN
TWISTED PAIR LINE
TO
LOOPSENSE ELEMENT
Active Probe Circuit

FIG. 28

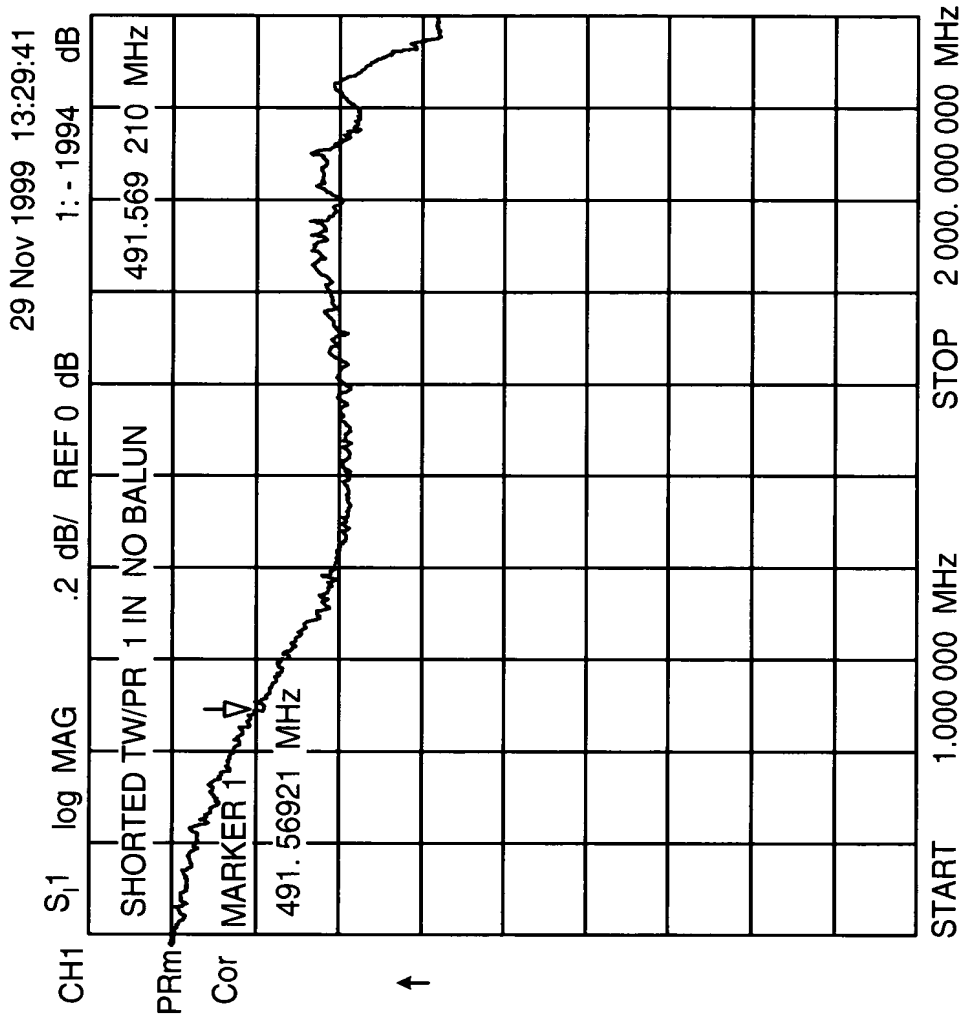

29 Nov 1999 13:29:41
CH1 S11 log MAG .2 dB/ REF 0 dB 1:- 1994 dB
SHORTED TW/PR 1 IN NO BALUN 491.569 210 MHz
PRm
Cor
MARKER 1
491.56921 MHz
START 1.000 000 MHz STOP 2 000.000 000 MHz

FIG. 29

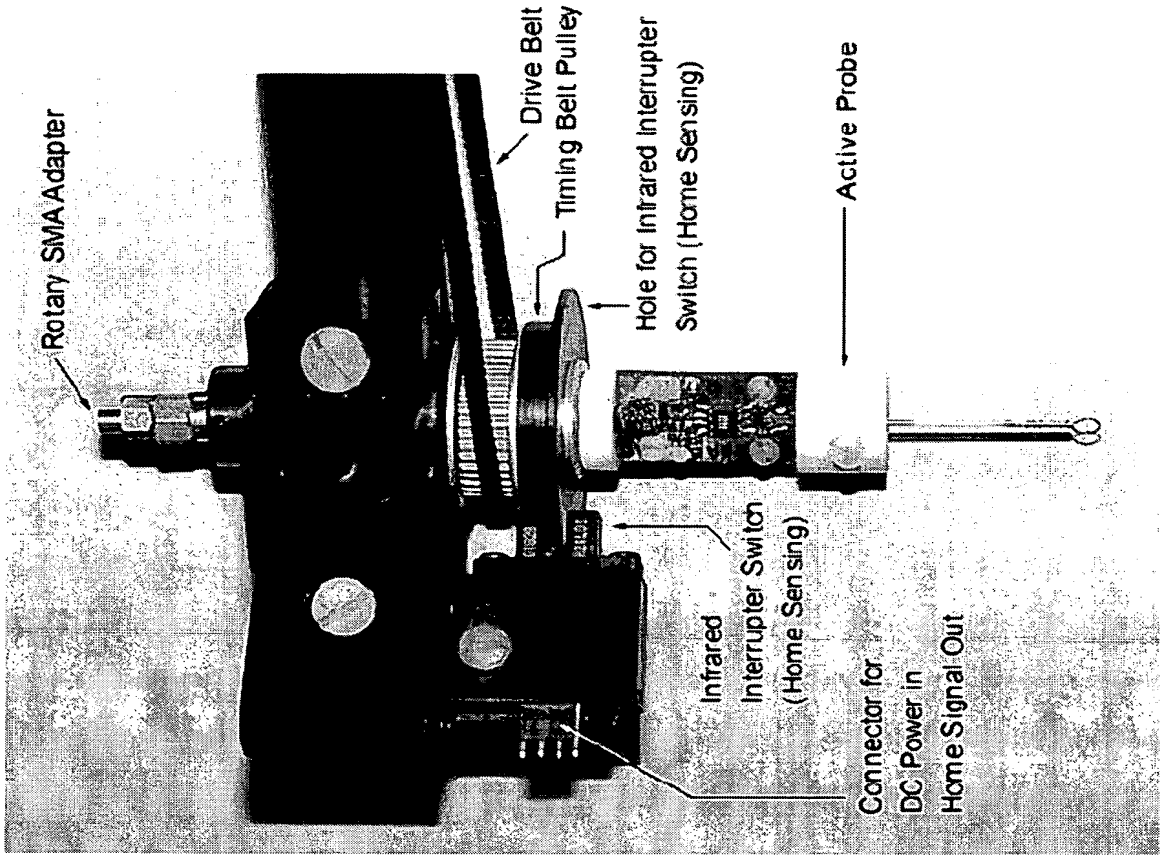

Rotary SMA Adapter
Drive Belt
Timing Belt Pulley
Hole for Infrared Interrupter Switch (Home Sensing)
Active Probe
Infrared Interrupter Switch (Home Sensing)
Connector for DC Power in Home Signal Out

FIG. 30

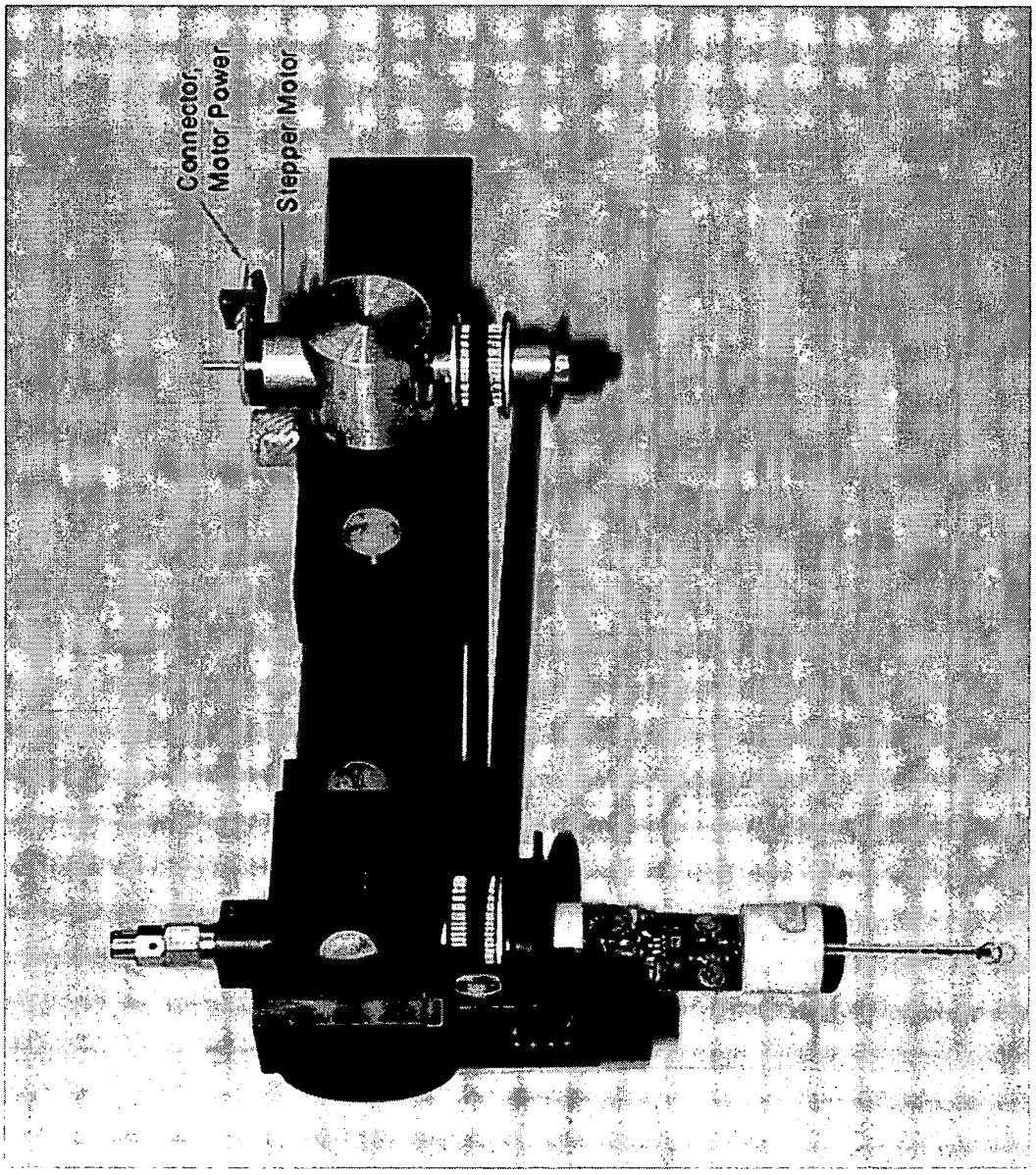


FIG. 31

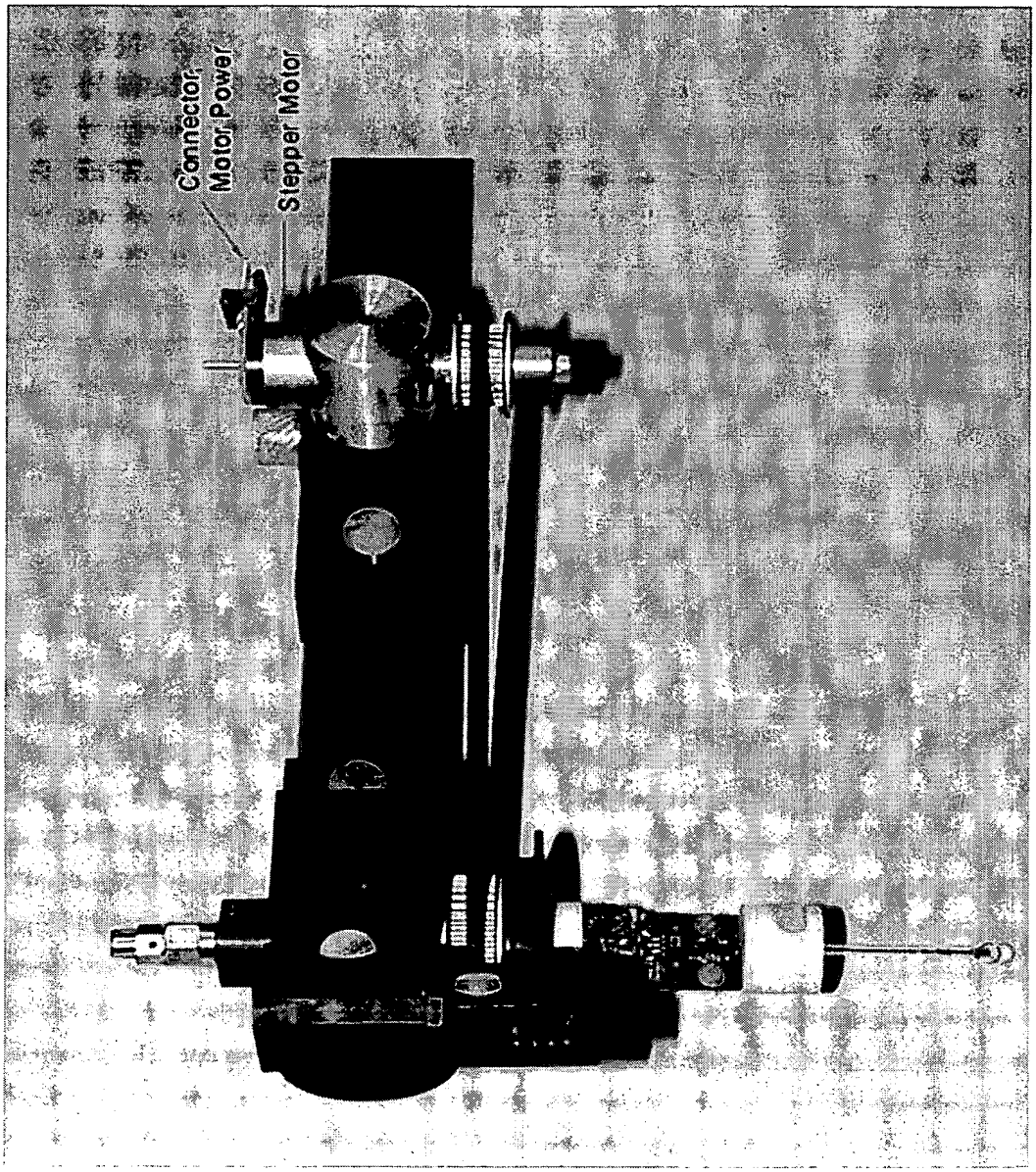


FIG. 32

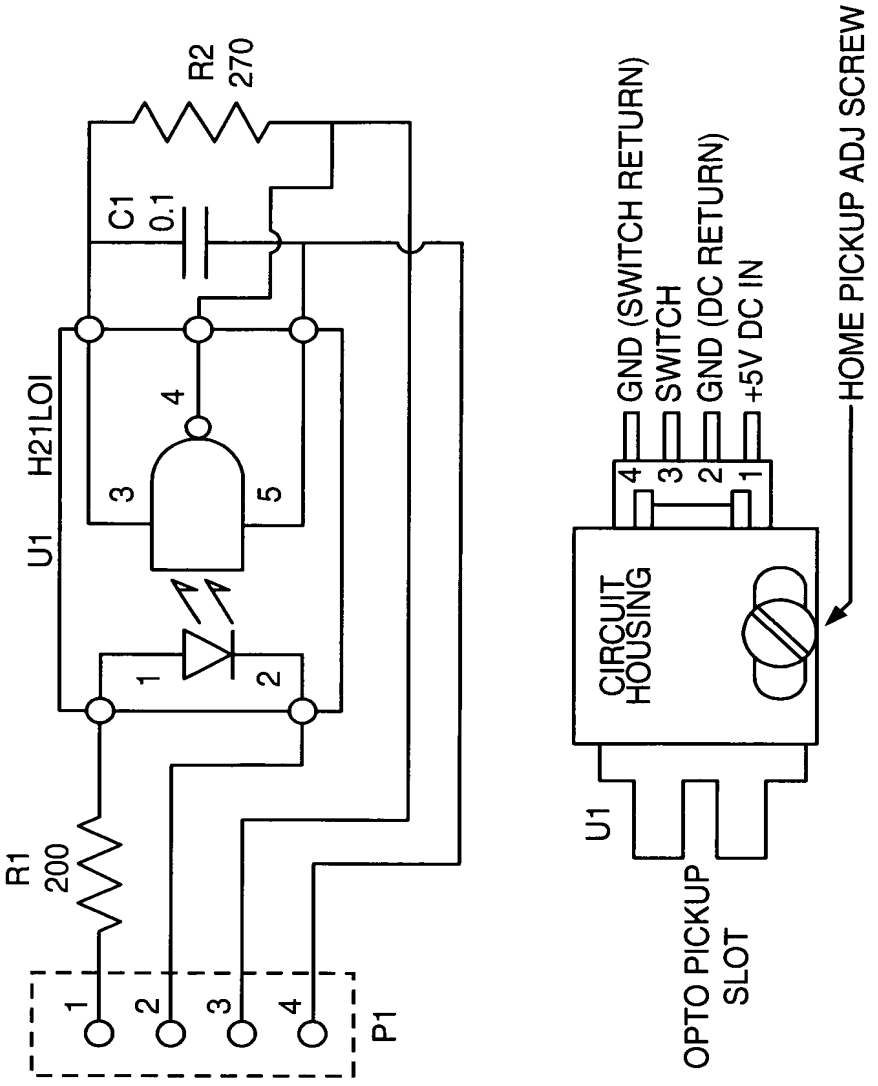

R2
270
C1
0.1
U1
H21LOI
4
3
5
1
2
R1
200
1
2
3
4
P1
GND (SWITCH RETURN)
SWITCH
GND (DC RETURN)
+5V DC IN
HOME PICKUP ADJ SCREW
CIRCUIT
HOUSING
U1
OPTO PICKUP
SLOT

FIG. 33

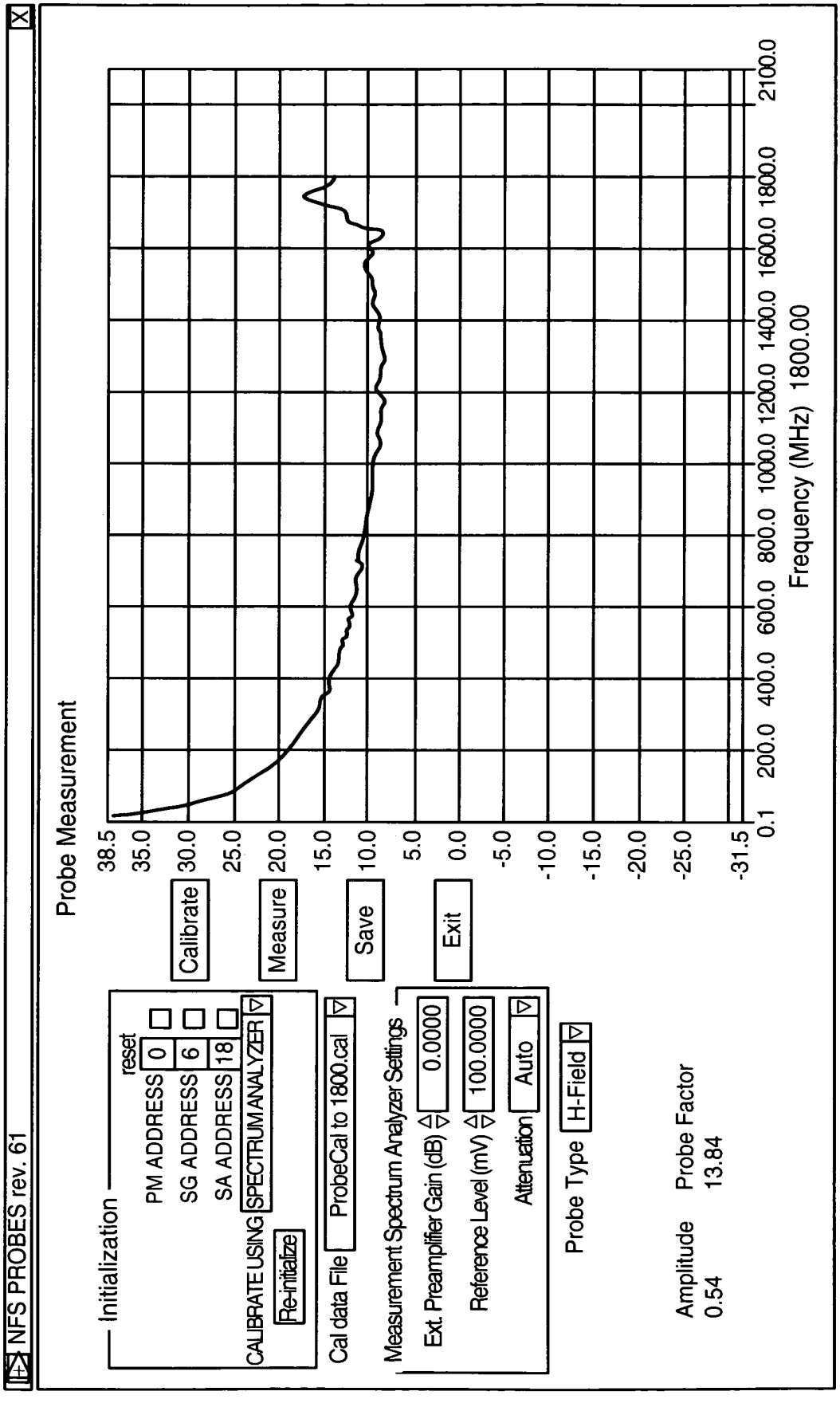

NFS PROBES rev. 61
Probe Measurement
Initialization
reset
PM ADDRESS 0
SG ADDRESS 6
SA ADDRESS 18
CALIBRATE USING SPECTRUMANALYZER
Re-initialize
Calibrate
Measure
Save
Exit
Cal data File ProbeCal to 1800.cal
Measurement Spectrum Analyzer Settings
Ext. Preamplifier Gain (dB) 0.0000
Reference Level (mV) 100.0000
Attenuation Auto
Probe Type H-Field
Amplitude 0.54
Probe Factor 13.84
38.5
35.0
30.0
25.0
20.0
15.0
10.0
5.0
0.0
-5.0
-10.0
-15.0
-20.0
-25.0
-31.5
0.1
200.0
400.0
600.0
800.0
1000.0
1200.0
1400.0
1600.0
1800.0
2100.0
Frequency (MHz) 1800.00

FIG. 34

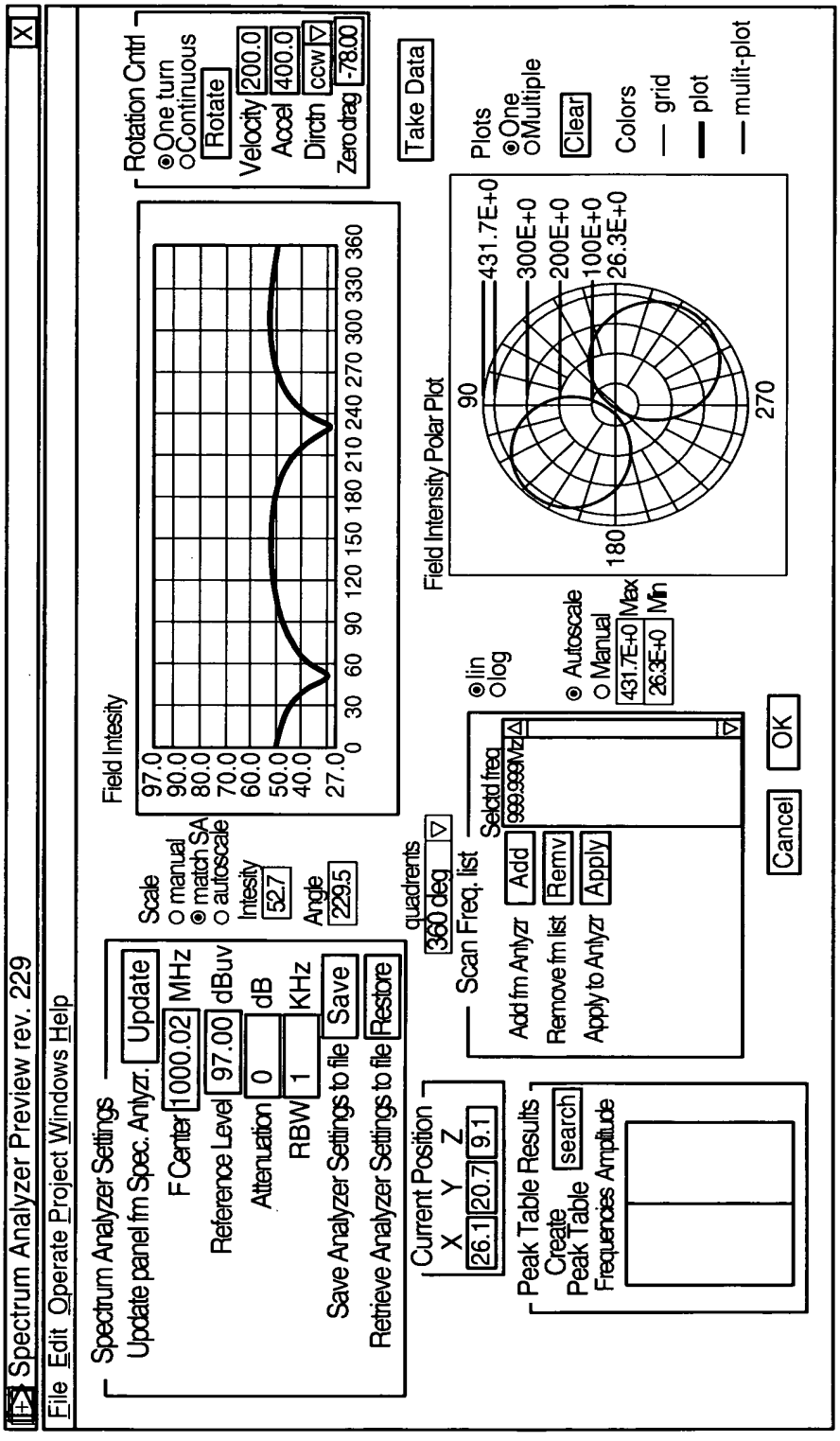

Spectrum Analyzer Preview rev. 229
File Edit Operate Project Windows Help
Spectrum Analyzer Settings
Update panel fm Spec. Anlyzr.
Update
F Center 1000.02 MHz
Reference Level 97.00 dBuv
Attenuation 0 dB
RBW 1 KHz
Save Analyzer Settings to file
Save
Retrieve Analyzer Settings to file
Restore
Scale
manual
match SA
autoscale
Intesity
52.7
Angle
229.5
Field Intesity
97.0
90.0
80.0
70.0
60.0
50.0
40.0
27.0
0 30 60 90 120 150 180 210 240 270 300 330 360
Rotation Cntrl
One turn
Continuous
Rotate
Velocity 200.0
Accel 400.0
Dirctn ccw
Zerodrag -78.00
Take Data
Plots
One
Multiple
Clear
Colors
grid
plot
mulit-plot
Field Intensity Polar Plot
90
180
270
431.7E+0
300E+0
200E+0
100E+0
26.3E+0
Current Position
X Y Z
26.1 20.7 9.1
Peak Table Results
Create Peak Table
search
Frequencies Amplitude
quadrents
360 deg
Scan Freq. list
Add fm Anlyzr
Add
Remove fm list
Remv
Apply to Anlyzr
Apply
Selctd freq
lin
log
Autoscale
Manual
431.7E+0 Max
26.3E+0 Min
Cancel
OK

FIG. 35

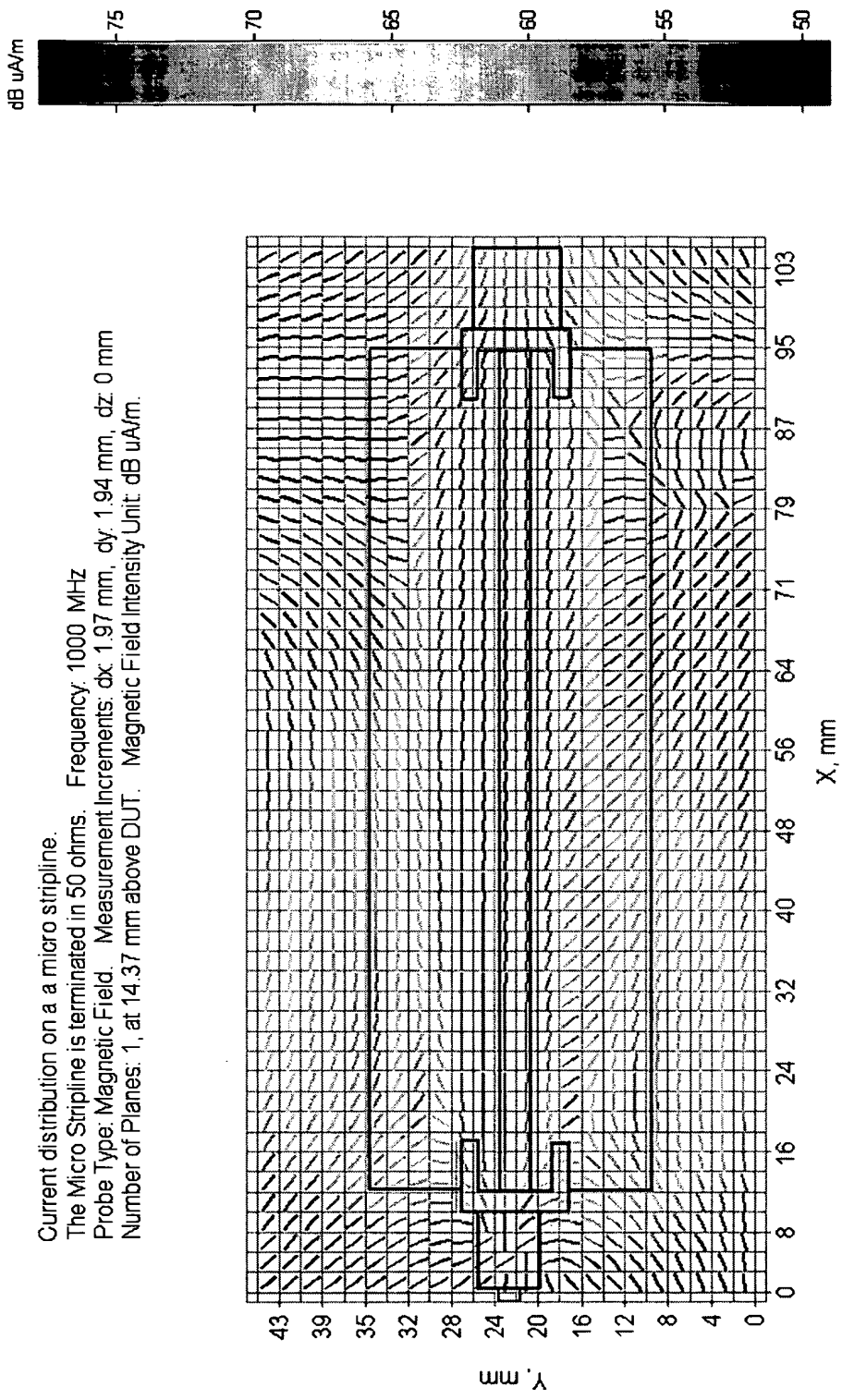

Current distribution on a a micro stripline.
The Micro Stripline is terminated in 50 ohms. Frequency: 1000 MHz
Probe Type: Magnetic Field. Measurement Increments: dx: 1.97 mm, dy: 1.94 mm, dz: 0 mm
Number of Planes: 1, at 14.37 mm above DUT. Magnetic Field Intensity Unit: dB uA/m.
dB uA/m
75
70
65
60
55
50
Y, mm
0
4
8
12
16
20
24
28
32
35
39
43
X, mm
0
8
16
24
32
40
48
56
64
71
79
87
95
103

FIG. 36

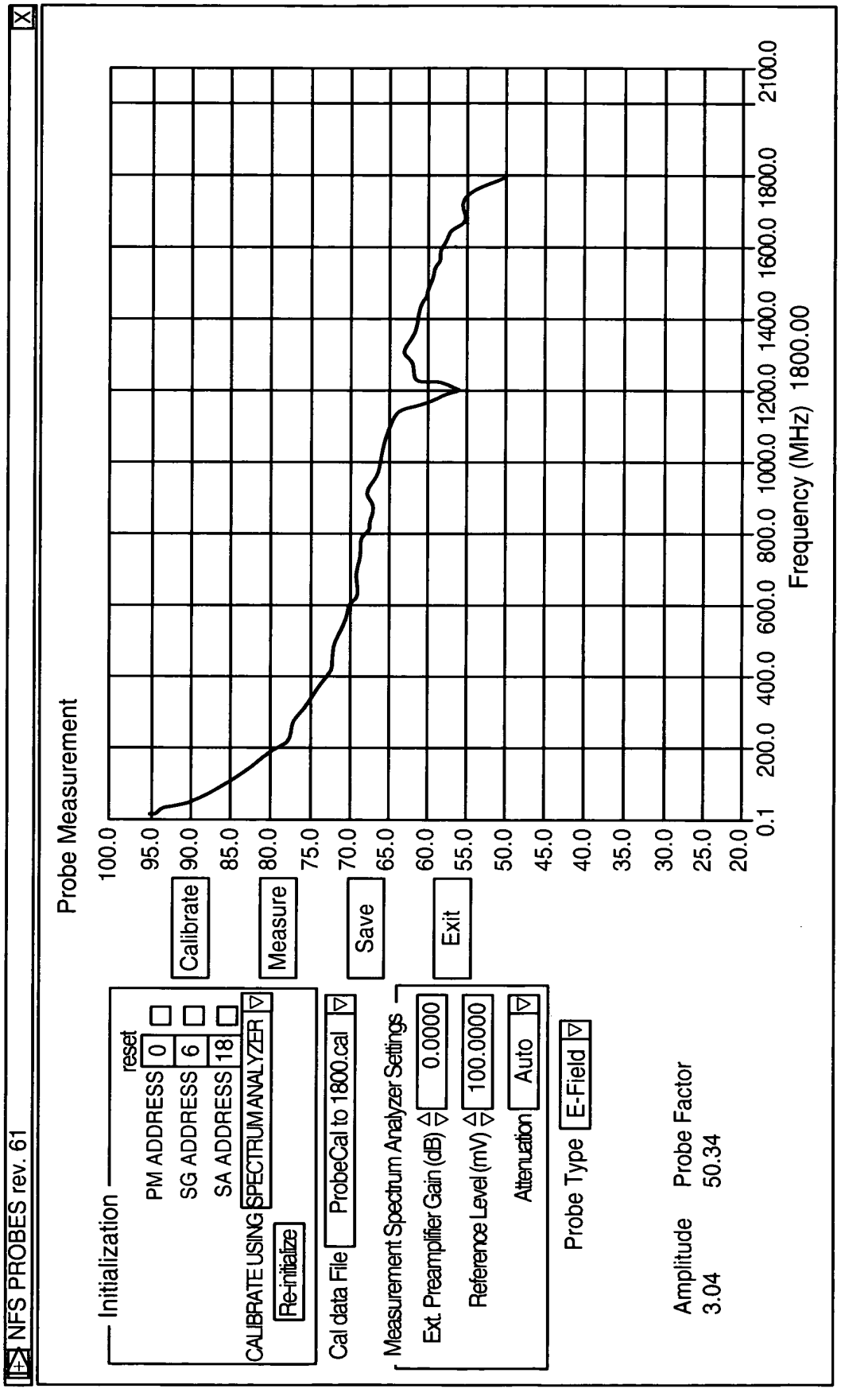

NFS PROBES rev. 61
Probe Measurement
Initialization
reset
PM ADDRESS 0
SG ADDRESS 6
SA ADDRESS 18
CALIBRATE USING SPECTRUM ANALYZER
Re-initialize
Cal data File ProbeCal to 1800.cal
Calibrate
Measure
Save
Exit
Measurement Spectrum Analyzer Settings
Ext. Preamplifier Gain (dB) 0.0000
Reference Level (mV) 100.0000
Attenuation Auto
Probe Type E-Field
Amplitude 3.04
Probe Factor 50.34
100.0
95.0
90.0
85.0
80.0
75.0
70.0
65.0
60.0
55.0
50.0
45.0
40.0
35.0
30.0
25.0
20.0
0.1
200.0
400.0
600.0
800.0
1000.0
1200.0
1400.0
1600.0
1800.0
2100.0
Frequency (MHz) 1800.00

FIG. 37

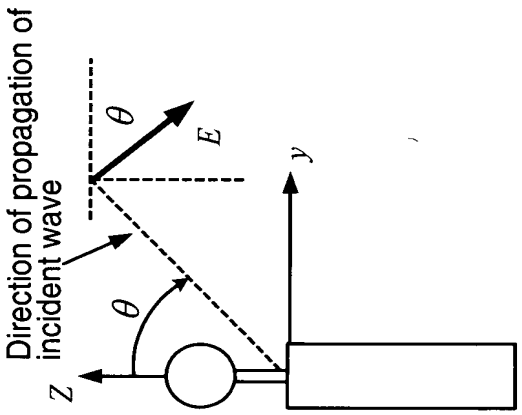


FIG. 38

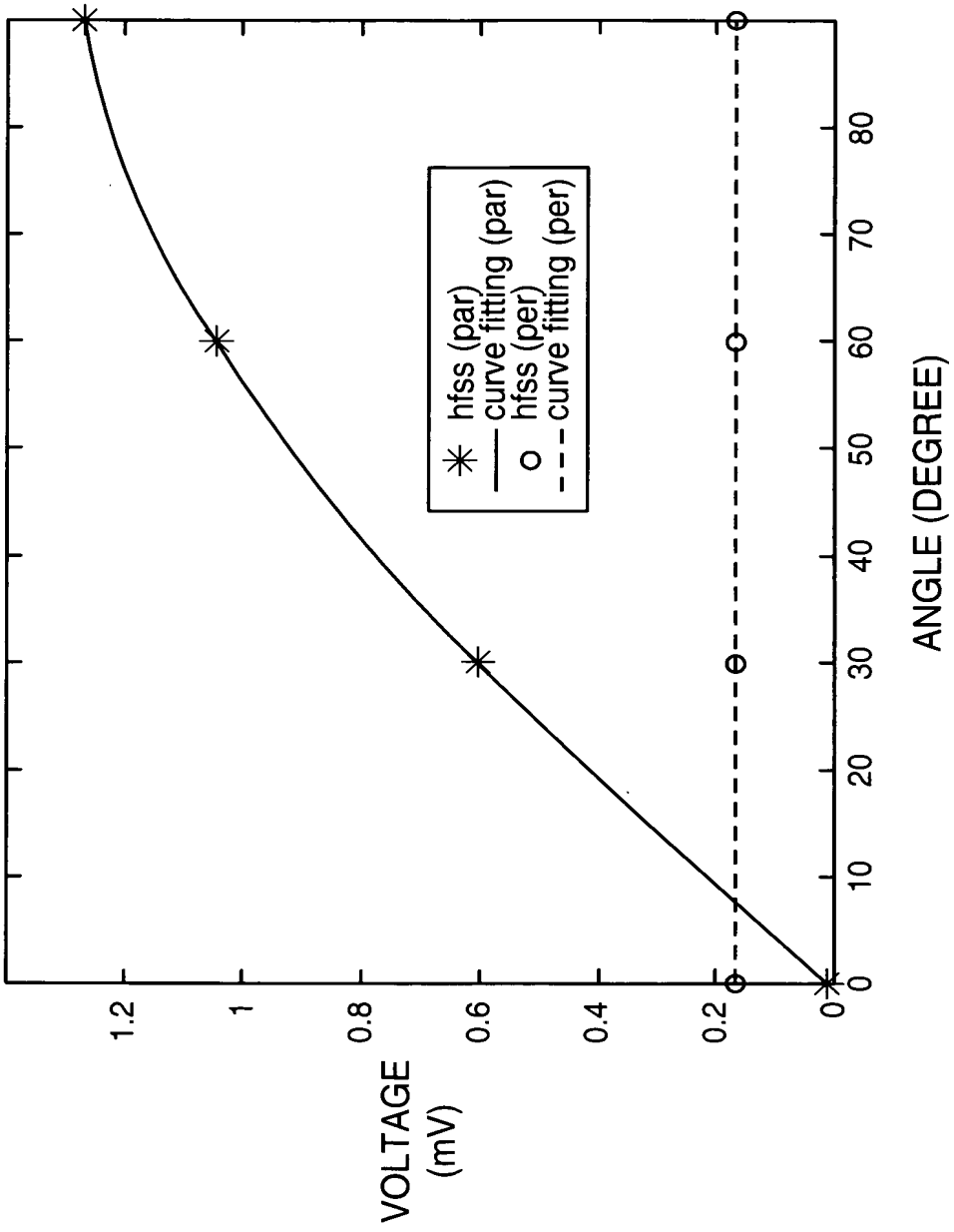

hfss (par)
curve fitting (par)
hfss (per)
curve fitting (per)
VOLTAGE (mV)
ANGLE (DEGREE)
0
0.2
0.4
0.6
0.8
1
1.2
0
10
20
30
40
50
60
70
80

FIG. 39

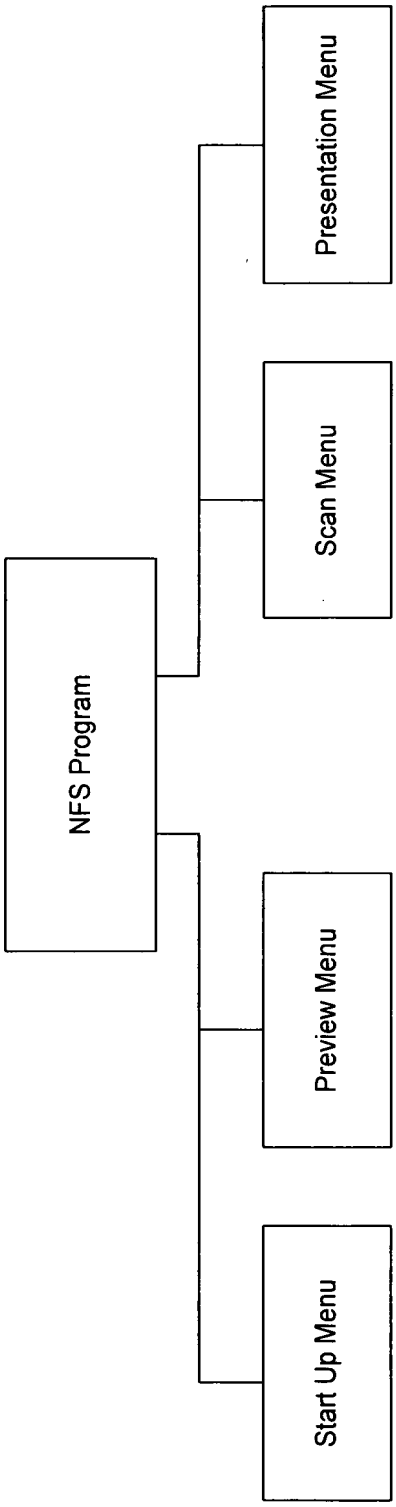

NFS Program
Start Up Menu
Preview Menu
Scan Menu
Presentation Menu

FIG. 40

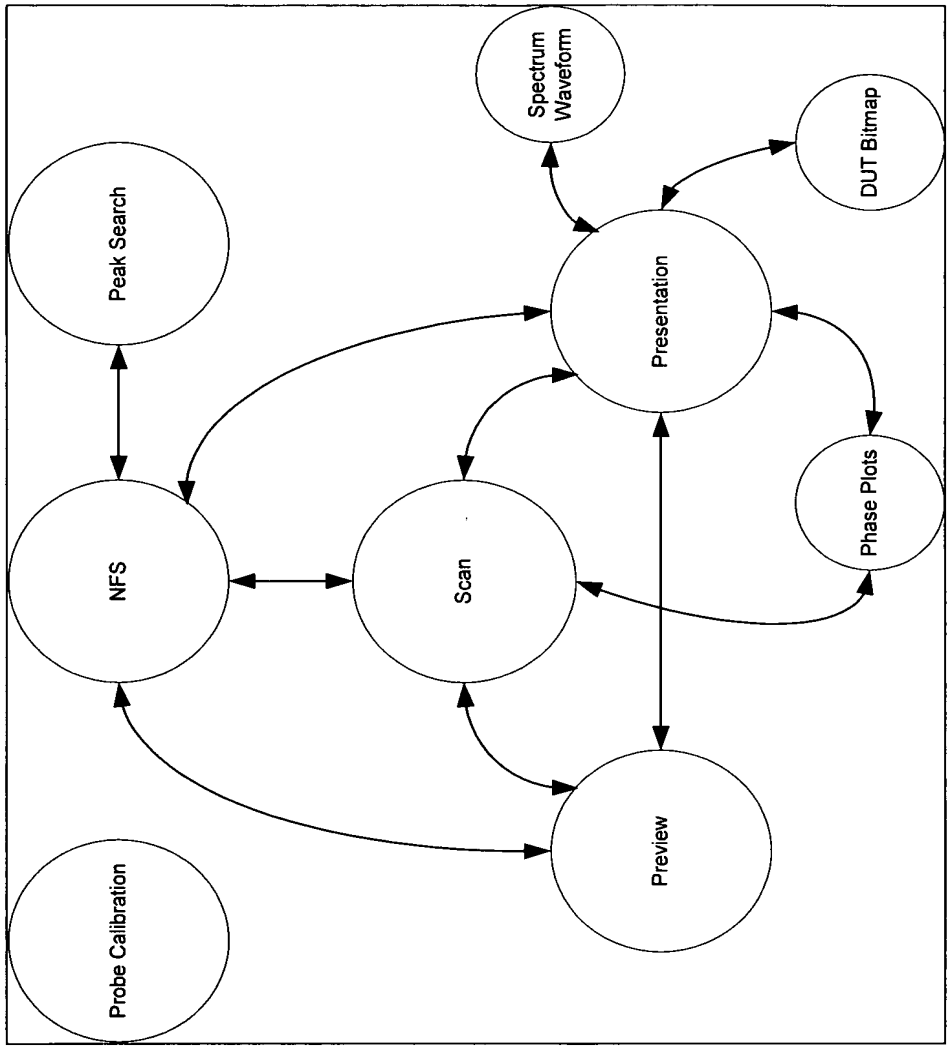

Spectrum
Waveform
DUT Bitmap
Peak Search
Presentation
NFS
Scan
Phase Plots
Probe Calibration
Preview

FIG. 41

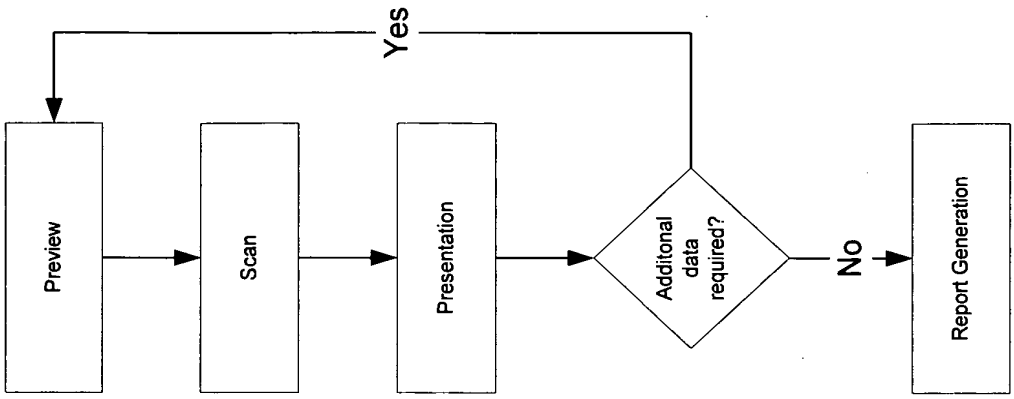

Yes
Preview
Scan
Presentation
Additonal data required?
No
Report Generation

FIG. 42

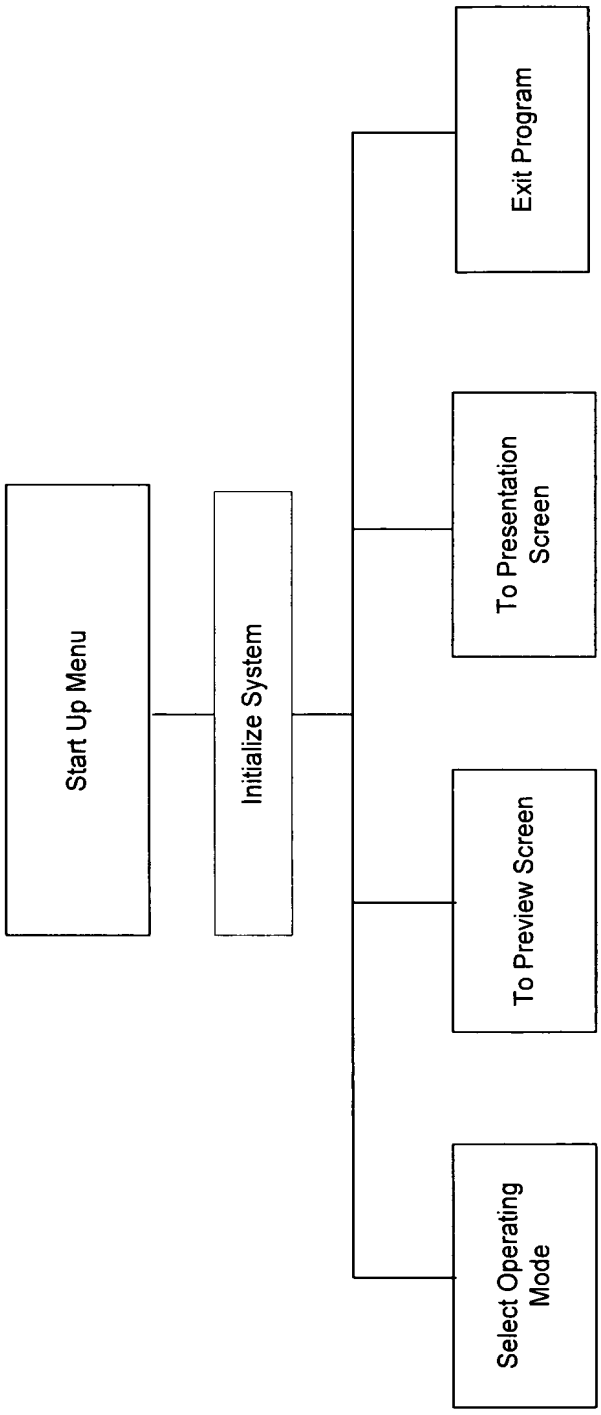

Start Up Menu
Initialize System
Exit Program
To Presentation Screen
To Preview Screen
Select Operating Mode

FIG. 43

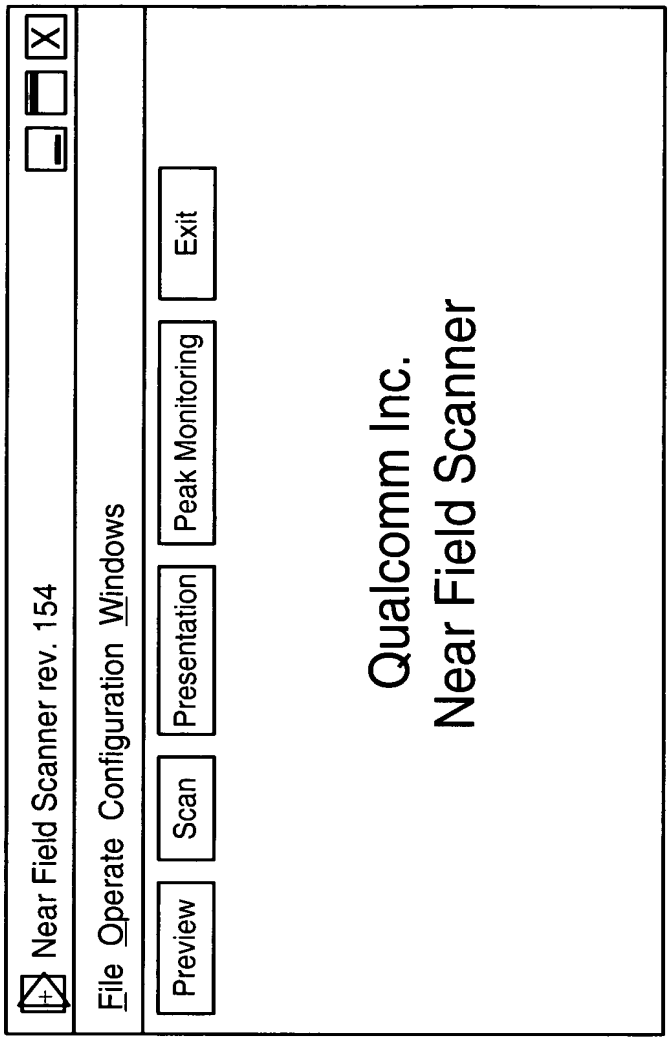

Near Field Scanner rev. 154
File Operate Configuration Windows
Preview
Scan
Presentation
Peak Monitoring
Exit
Qualcomm Inc.
Near Field Scanner

FIG. 44

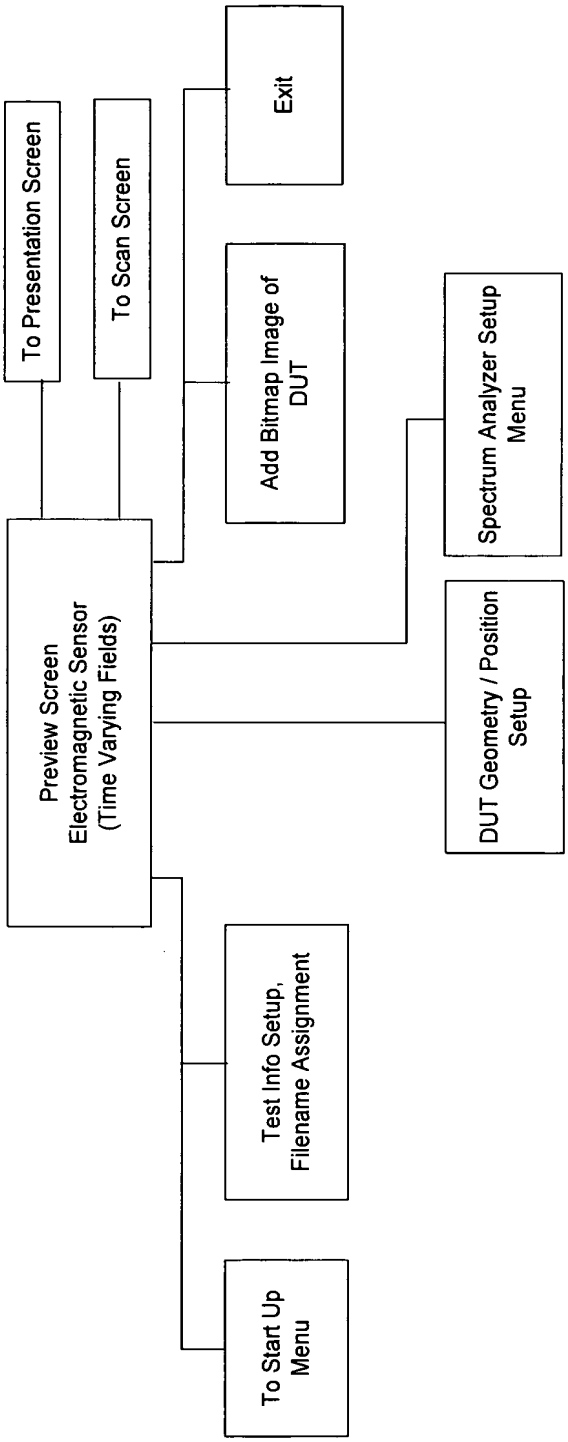

To Presentation Screen
To Scan Screen
Exit
Add Bitmap Image of DUT
Spectrum Analyzer Setup Menu
Preview Screen Electromagnetic Sensor (Time Varying Fields)
DUT Geometry / Position Setup
Test Info Setup, Filename Assignment
To Start Up Menu

FIG. 45

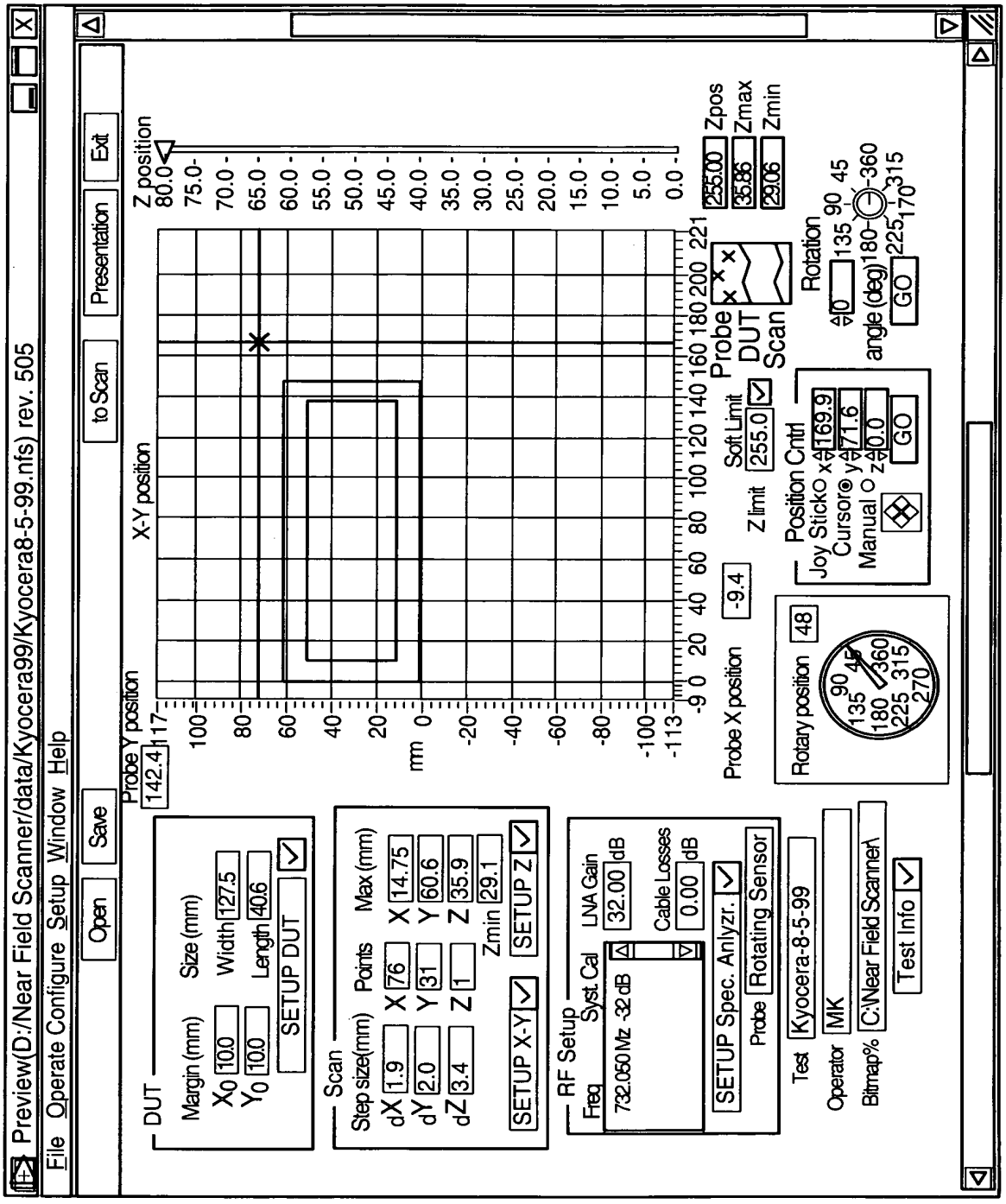

Preview(D:/Near Field Scanner/data/Kyocera99/Kyocera8-5-99.nfs) rev. 505
File Operate Configure Setup Window Help
Open
Save
to Scan
Presentation
Exit
DUT
Margin (mm)
Size (mm)
Xo 10.0
Yo 10.0
Width 127.5
Length 40.6
SETUP DUT
Scan
Step size(mm)
Points
Max (mm)
dX 1.9
X 76
X 14.75
dY 2.0
Y 31
Y 60.6
dZ 3.4
Z 1
Z 35.9
Zmin 29.1
SETUP X-Y
SETUP Z
RF Setup
Freq
Syst.Cal
LNA Gain
732.050 Mz -32 dB
32.00 dB
Cable Losses
0.00 dB
SETUP Spec. Anlyzr.
Probe
Rotating Sensor
Test
Kyocera-8-5-99
Operator
MK
Bitmap%
C:\Near Field Scanner\
Test Info
Probe Y position
142.4
117
X-Y position
Z position
80.0
mm
Probe X position
-9.4
Rotary position
48
Z limit
Soft Limit
255.0
Probe
DUT
Scan
Position Cntrl
Joy Stick
Cursor
Manual
x 169.9
y 71.6
z 0.0
GO
Rotation
angle (deg)
GO
255.00
Zpos
35.86
Zmax
29.06
Zmin

FIG. 46

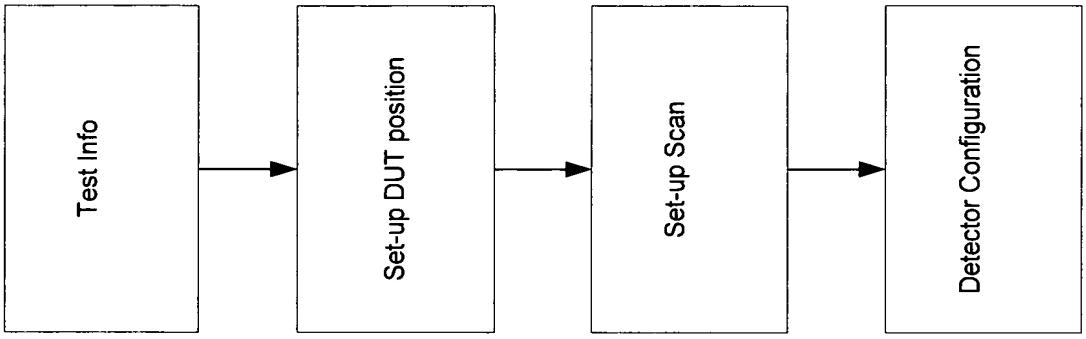

Test Info
Set-up DUT position
Set-up Scan
Detector Configuration

FIG. 47

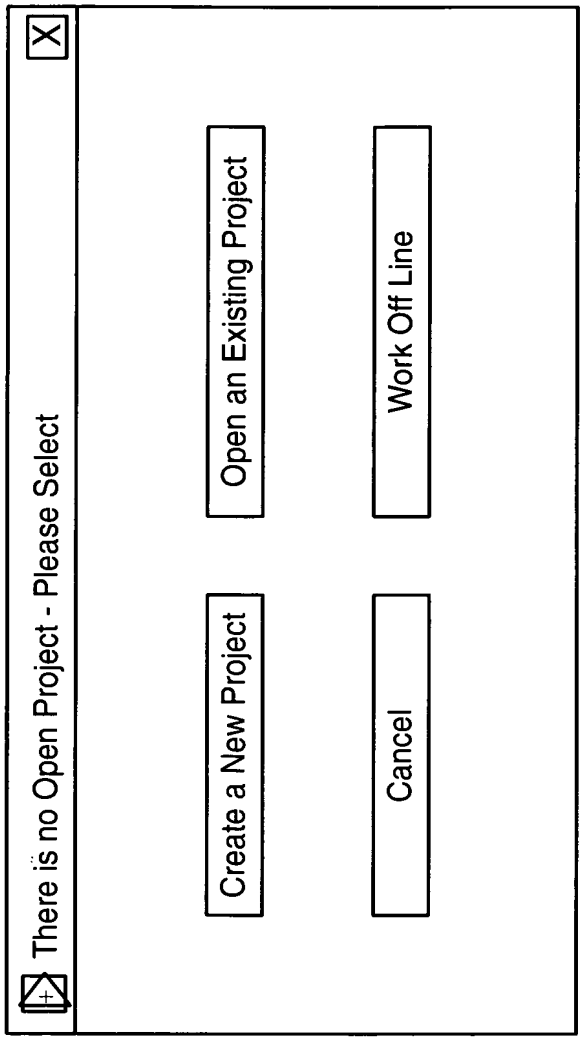

There is no Open Project - Please Select
Create a New Project
Open an Existing Project
Cancel
Work Off Line

FIG. 48

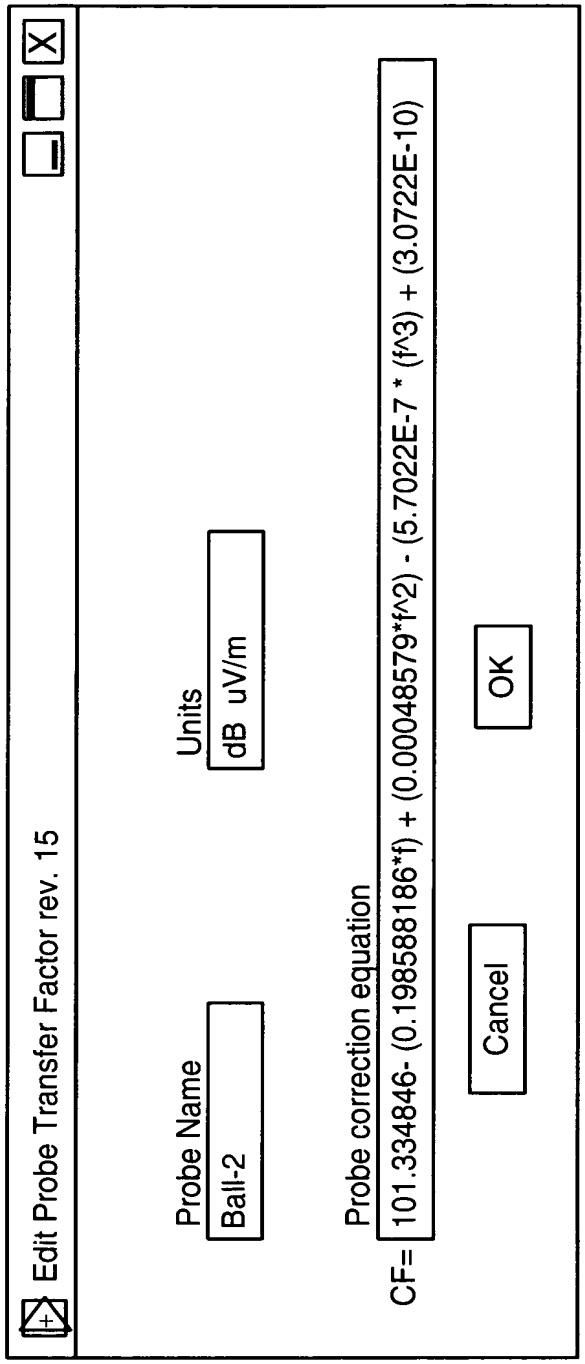

Edit Probe Transfer Factor rev. 15
Probe Name
Ball-2
Units
dB uV/m
Probe correction equation
CF= 101.334846- (0.198588186*f) + (0.00048579*f^2) - (5.7022E-7 * (f^3) + (3.0722E-10)
Cancel
OK

FIG. 49

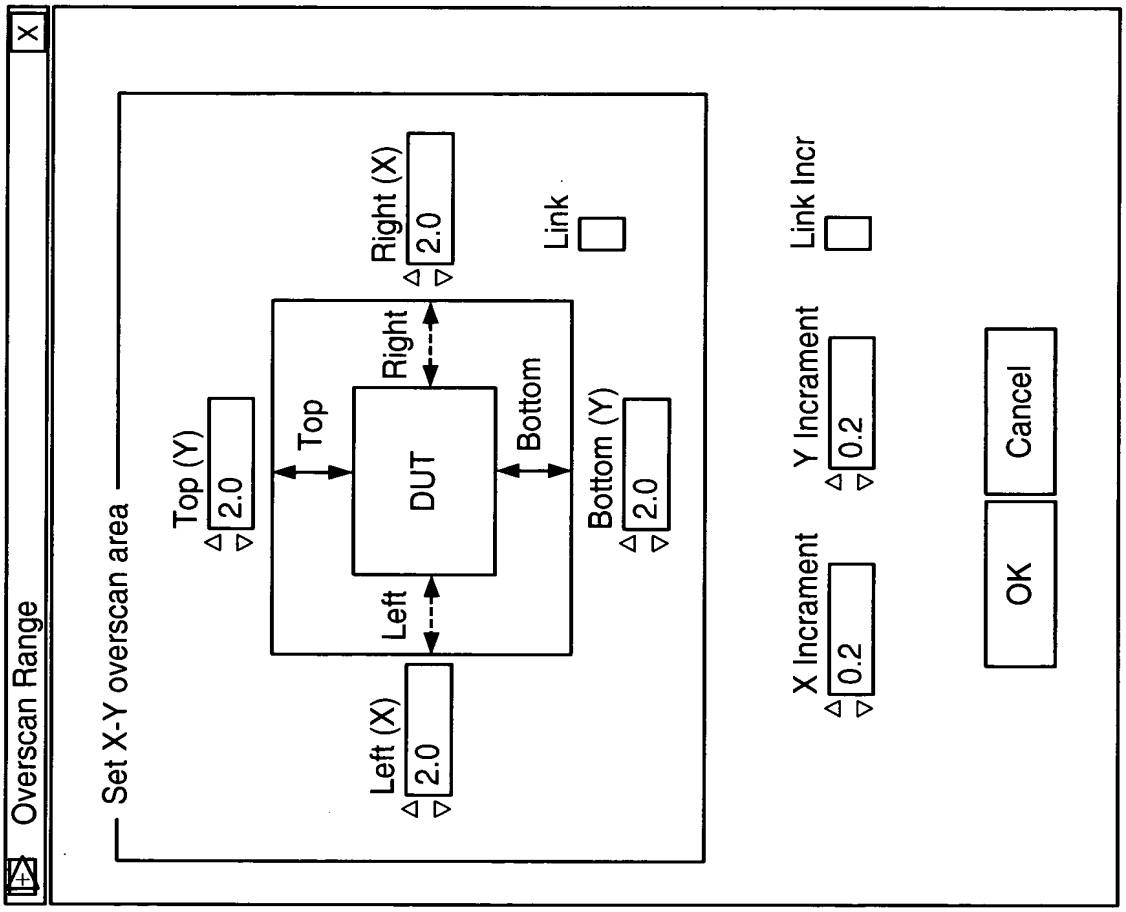

Overscan Range
Set X-Y overscan area
Top (Y)
2.0
Top
Right
DUT
Bottom
Left
Left (X)
2.0
Right (X)
2.0
Bottom (Y)
2.0
Link
Link Incr
X Increment
0.2
Y Increment
0.2
OK
Cancel

FIG. 50

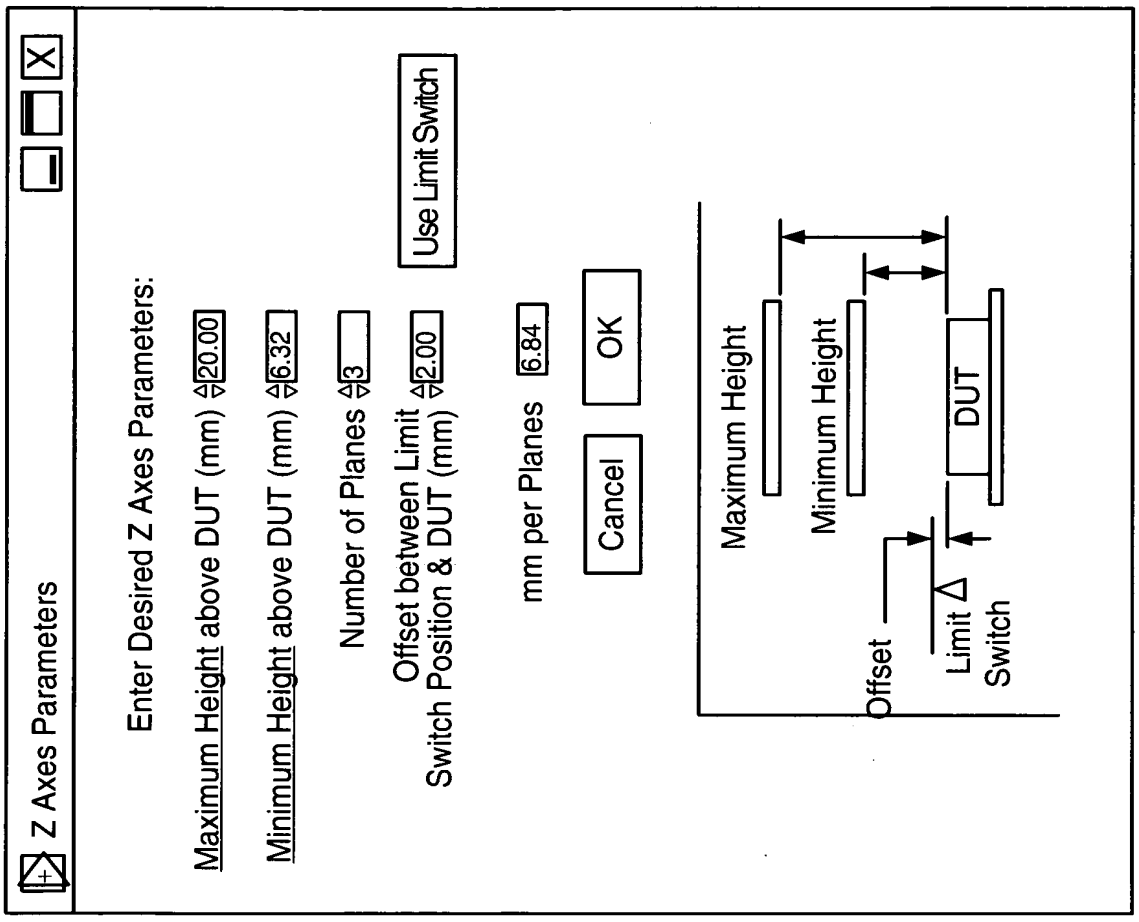

Z Axes Parameters
Enter Desired Z Axes Parameters:
Maximum Height above DUT (mm) 20.00
Minimum Height above DUT (mm) 6.32
Number of Planes 3
Offset between Limit Switch Position & DUT (mm) 2.00
Use Limit Switch
mm per Planes 6.84
Cancel
OK
Maximum Height
Minimum Height
Offset
Limit Switch
Δ
DUT

FIG. 51

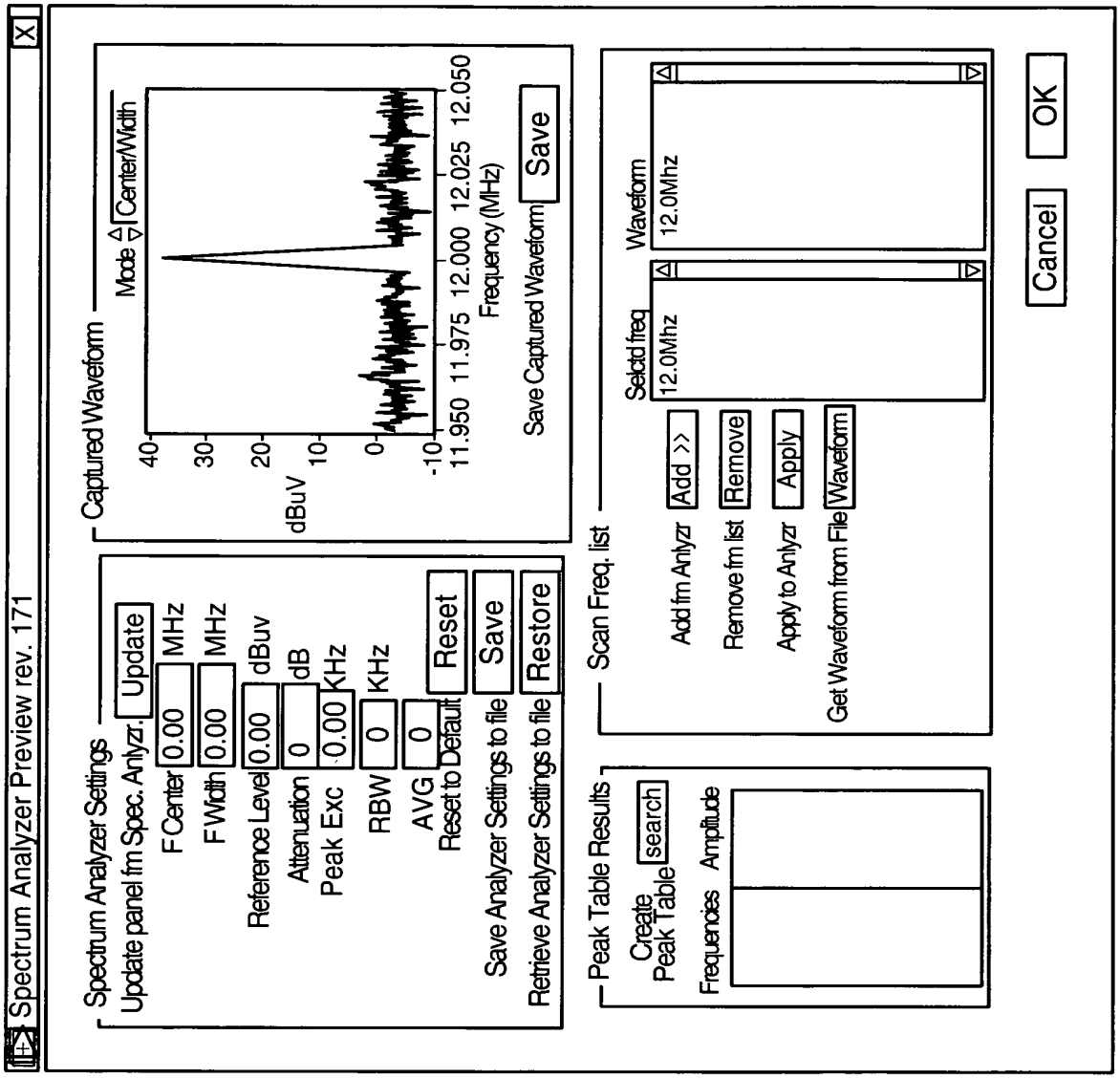

Spectrum Analyzer Preview rev. 171
Spectrum Analyzer Settings
Update panel frm Spec. Anlyzr:
Update
F Center
0.00
MHz
F Width
0.00
MHz
Reference Level
0.00
dBuv
Attenuation
0
dB
Peak Exc
0.00
KHz
RBW
0
KHz
AVG
0
Reset to Default
Reset
Save Analyzer Settings to file
Save
Retrieve Analyzer Settings to file
Restore
Captured Waveform
Mode
Center/Width
40
30
20
10
0
-10
dBuV
11.950
11.975
12.000
12.025
12.050
Frequency (MHz)
Save Captured Waveform
Save
Peak Table Results
Create Peak Table
search
Frequencies
Amplitude
Scan Freq. list
Selctd freq
12.0Mhz
Waveform
12.0Mhz
Add frm Anlyzr
Add >>
Remove frm list
Remove
Apply to Anlyzr
Apply
Get Waveform from File
Waveform
Cancel
OK

FIG. 52

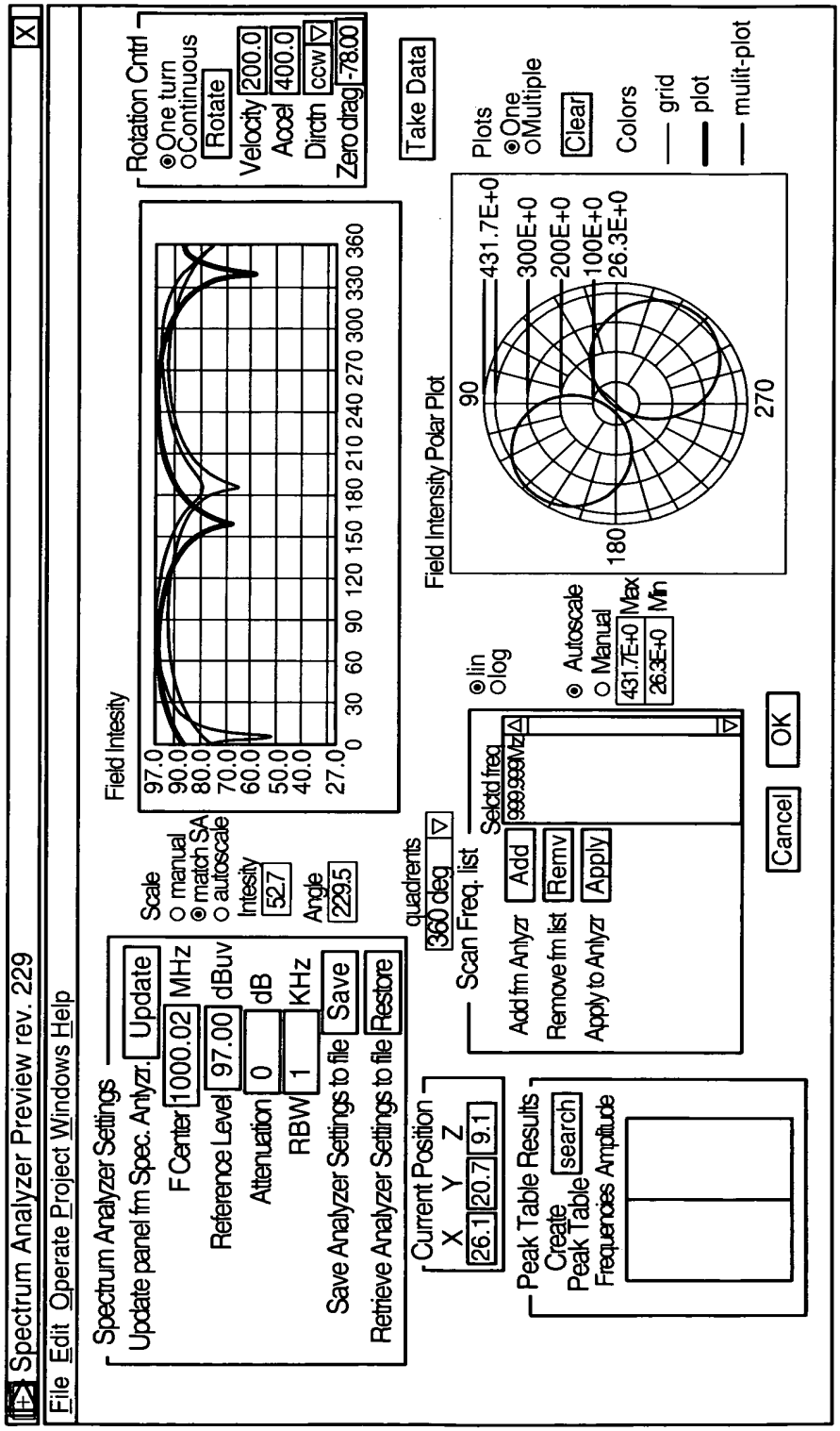

Spectrum Analyzer Preview rev. 229
File Edit Operate Project Windows Help
Spectrum Analyzer Settings
Update panel frm Spec. Anlyzr.
Update
F Center 1000.02 MHz
Reference Level 97.00 dBuv
Attenuation 0 dB
RBW 1 KHz
Save Analyzer Settings to file
Save
Retrieve Analyzer Settings to file
Restore
Scale
manual
match SA
autoscale
Intesity 52.7
Angle 229.5
Field Intesity
97.0
90.0
80.0
70.0
60.0
50.0
40.0
27.0
0 30 60 90 120 150 180 210 240 270 300 330 360
Rotation Cntrl
One turn
Continuous
Rotate
Velocity 200.0
Accel 400.0
Dirctn ccw
Zero drag -78.00
Take Data
Plots
One
Multiple
Clear
Colors
grid
plot
mulit-plot
Field Intensity Polar Plot
90
180
270
431.7E+0
300E+0
200E+0
100E+0
26.3E+0
Current Position
X Y Z
26.1 20.7 9.1
Peak Table Results
Create Peak Table
search
Frequencies Amplitude
quadrents
360 deg
Scan Freq. list
Add fm Anlyzr
Add
Remove fm list
Remv
Apply to Anlyzr
Apply
Selctd freq
999.999MHz
lin
log
Autoscale
Manual
431.7E+0 Max
26.3E+0 Min
Cancel
OK

FIG. 53

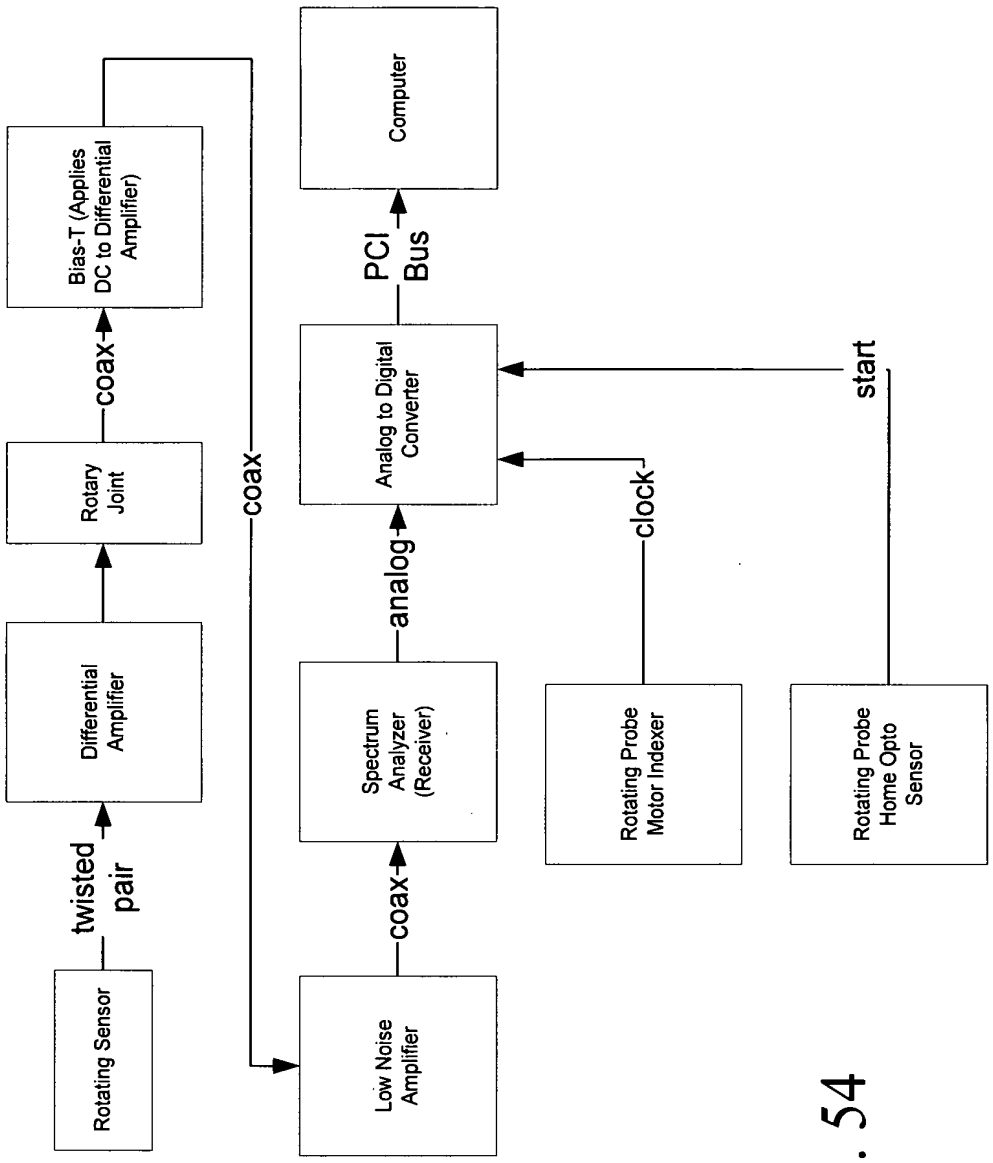

Rotating Sensor
twisted pair
Differential Amplifier
Rotary Joint
coax
Bias-T (Applies DC to Differential Amplifier)
coax
Low Noise Amplifier
coax
Spectrum Analyzer (Receiver)
analog
Analog to Digital Converter
PCI Bus
Computer
clock
Rotating Probe Motor Indexer
start
Rotating Probe Home Opto Sensor

FIG. 54

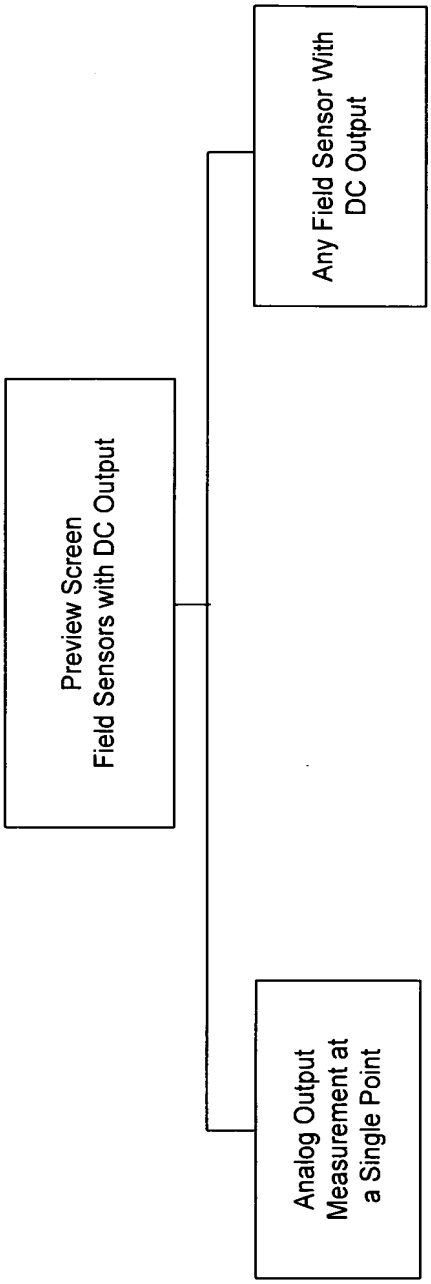

Preview Screen
Field Sensors with DC Output
Any Field Sensor With
DC Output
Analog Output
Measurement at
a Single Point

FIG. 55

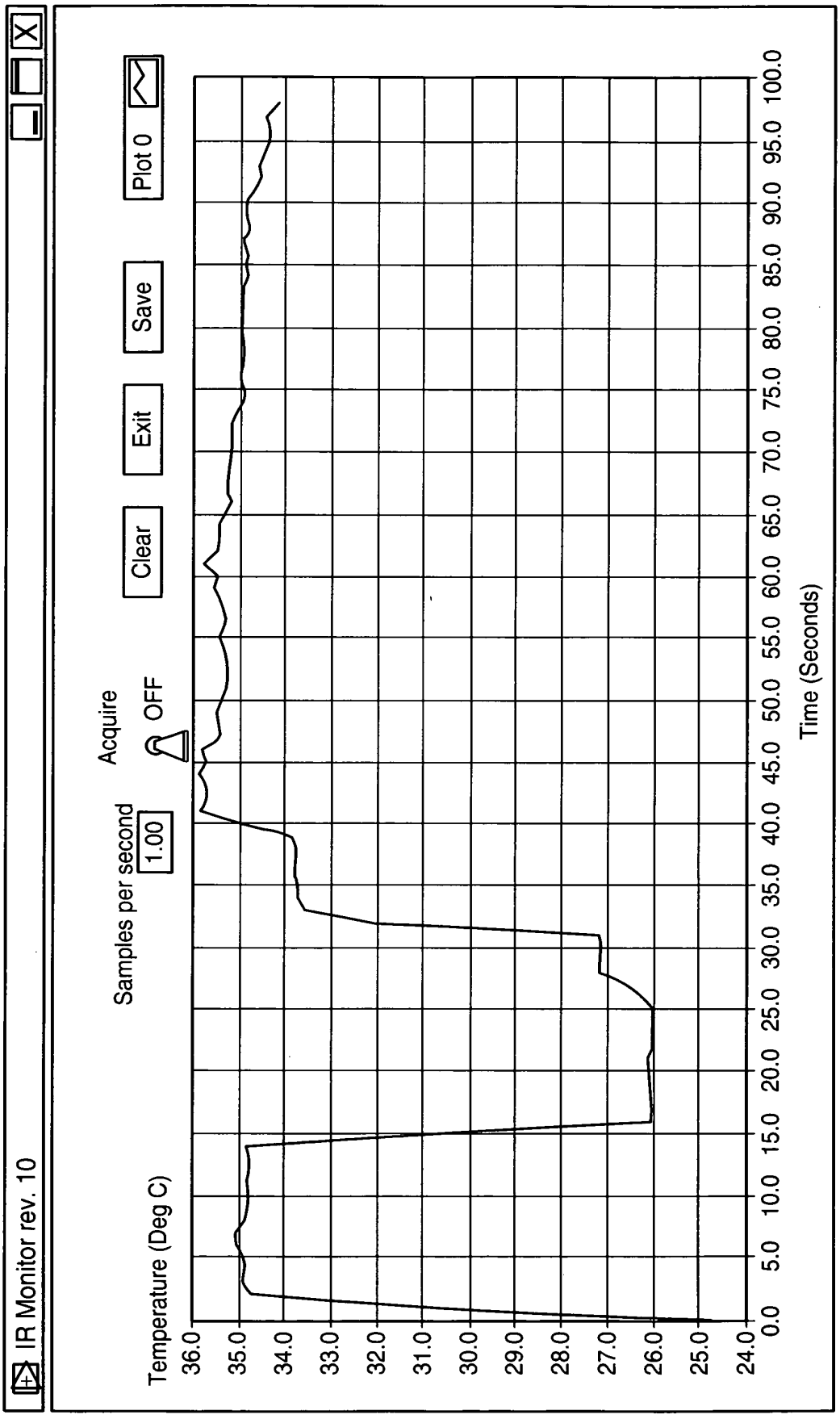

IR Monitor rev. 10
Temperature (Deg C)
Samples per second
1.00
Acquire
OFF
Clear
Exit
Save
Plot 0
Time (Seconds)
36.0
35.0
34.0
33.0
32.0
31.0
30.0
29.0
28.0
27.0
26.0
25.0
24.0
0.0
5.0
10.0
15.0
20.0
25.0
30.0
35.0
40.0
45.0
50.0
55.0
60.0
65.0
70.0
75.0
80.0
85.0
90.0
95.0
100.0

FIG. 56

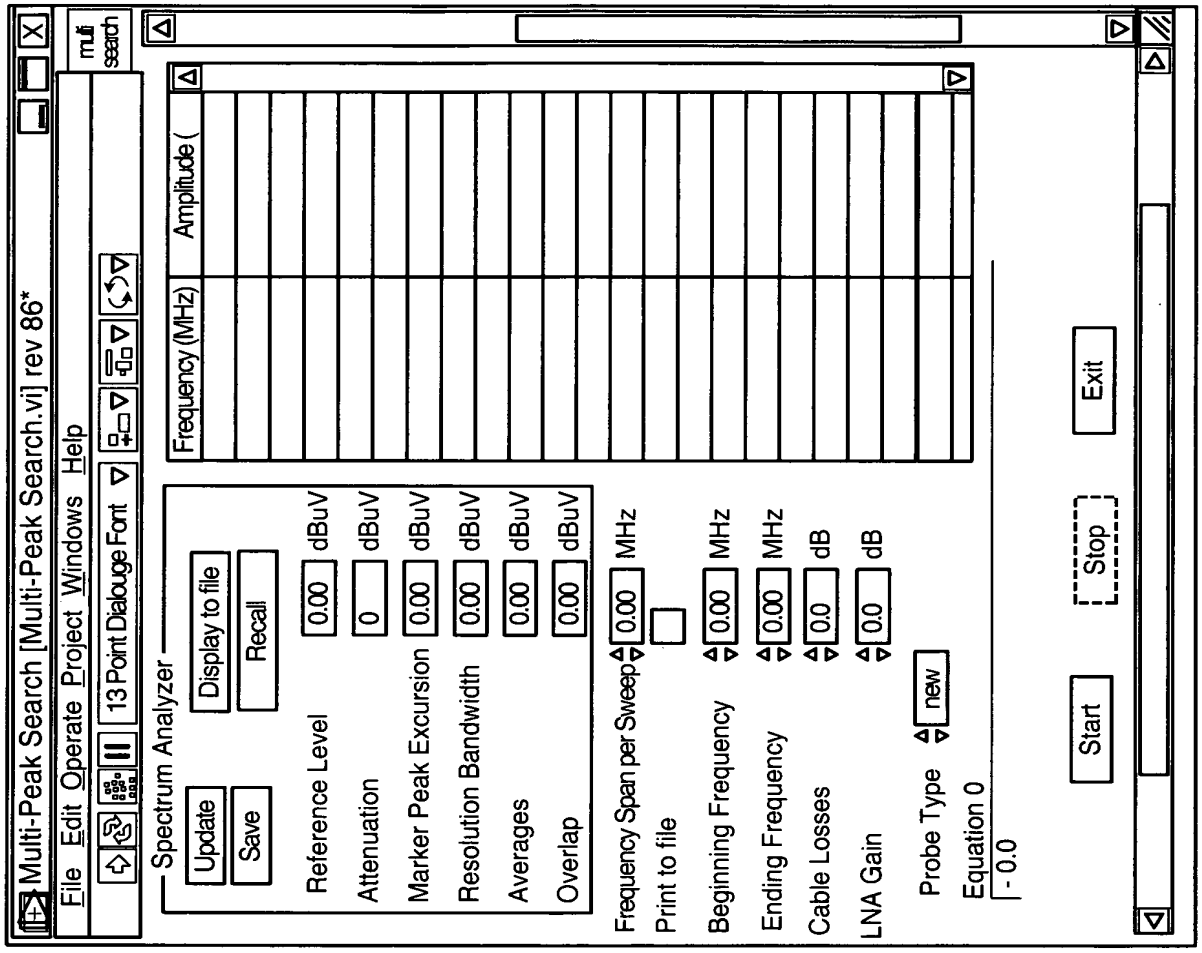

Multi-Peak Search [Multi-Peak Search.vi] rev 86*
File Edit Operate Project Windows Help
13 Point Dialouge Font
multi search
Spectrum Analyzer
Update
Save
Display to file
Recall
Reference Level 0.00 dBuV
Attenuation 0 dBuV
Marker Peak Excursion 0.00 dBuV
Resolution Bandwidth 0.00 dBuV
Averages 0.00 dBuV
Overlap 0.00 dBuV
Frequency Span per Sweep 0.00 MHz
Print to file
Beginning Frequency 0.00 MHz
Ending Frequency 0.00 MHz
Cable Losses 0.0 dB
LNA Gain 0.0 dB
Probe Type new
Equation 0
- 0.0
Frequency (MHz)
Amplitude (
Start
Stop
Exit

FIG. 57

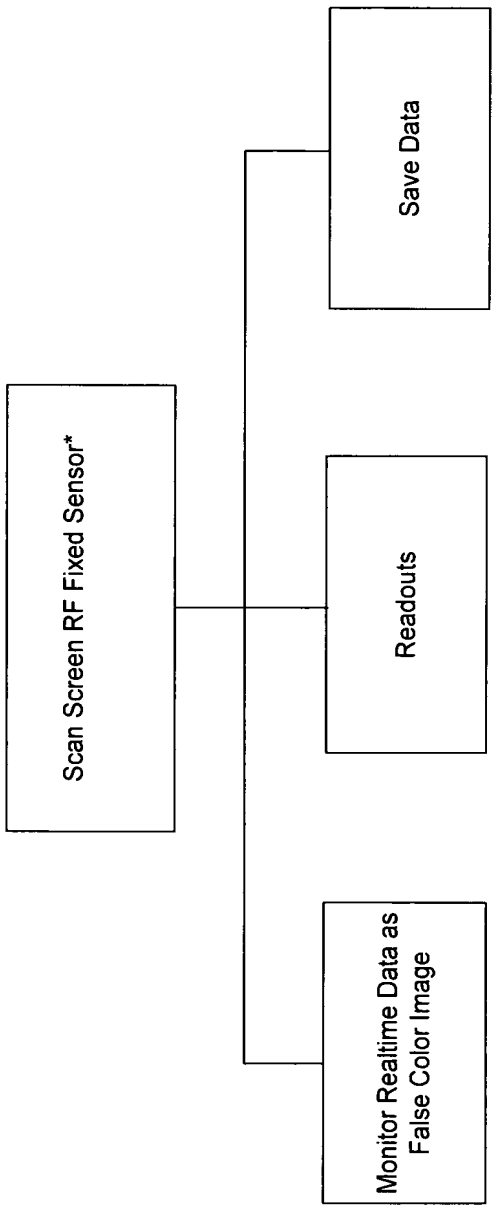

Scan Screen RF Fixed Sensor*
Save Data
Readouts
Monitor Realtime Data as False Color Image

FIG. 58

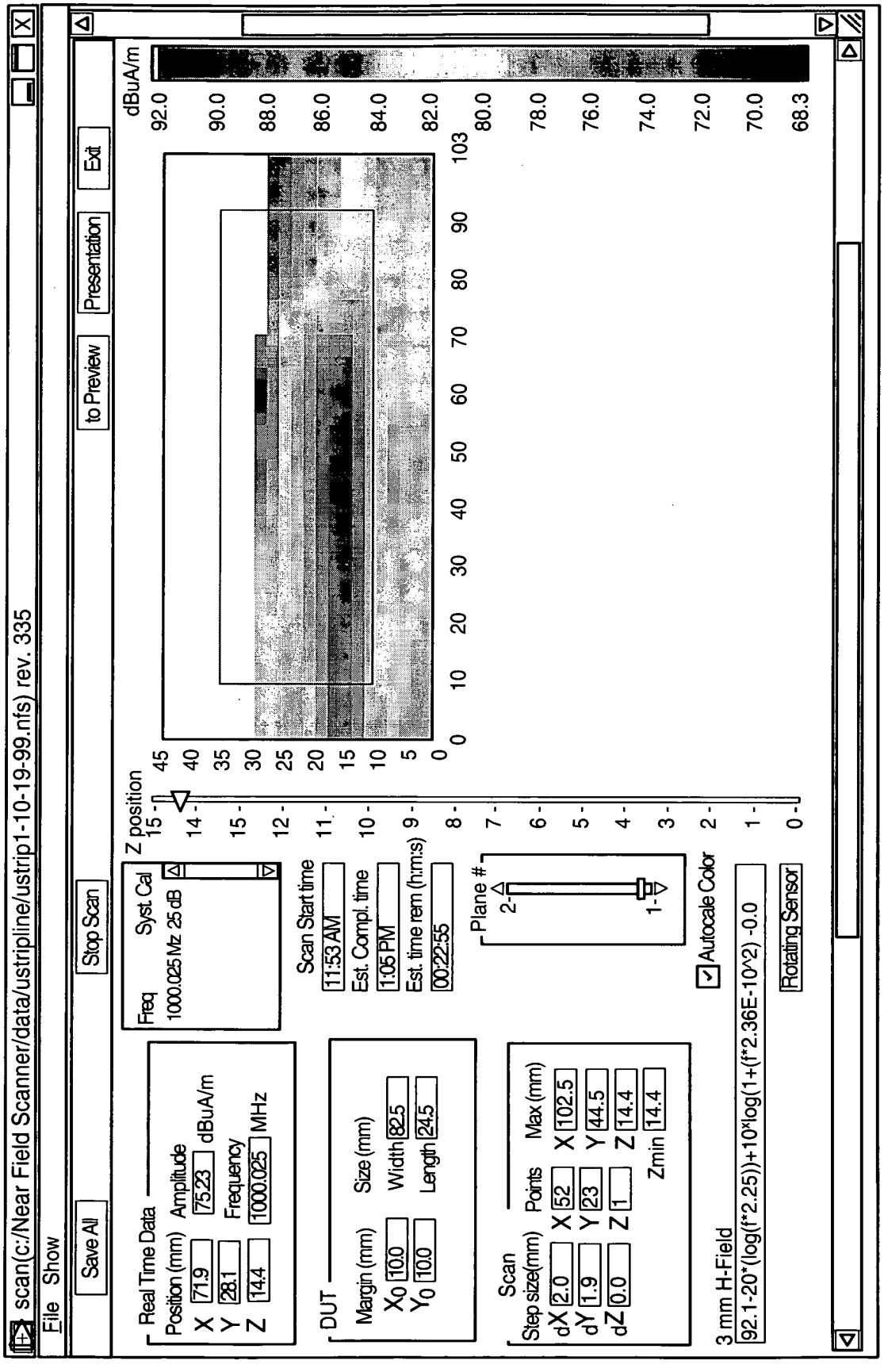

scan(c:/Near Field Scanner/data/ustripline/ustrip1-10-19-99.nfs) rev. 335
File Show
Save All
Stop Scan
to Preview
Presentation
Exit
Real Time Data
Position (mm)
X 71.9
Y 28.1
Z 14.4
Amplitude
75.23 dBuA/m
Frequency
1000.025 MHz
Freq Syst.Cal
1000.025 Mz 25 dB
Z position
DUT
Margin (mm)
Xo 10.0
Yo 10.0
Size (mm)
Width 82.5
Length 24.5
Scan Start time
11:53 AM
Est. Compl. time
1:05 PM
Est. time rem (h:m:s)
00:22:55
Plane #
2
1
Scan
Step size(mm)
dX 2.0
dY 1.9
dZ 0.0
Points
X 52
Y 23
Z 1
Max (mm)
X 102.5
Y 44.5
Z 14.4
Zmin 14.4
Autocale Color
3 mm H-Field
92.1-20*(log(f*2.25))+10*log(1+(f*2.36E-10^2) -0.0
Rotating Sensor
dBuA/m
92.0
90.0
88.0
86.0
84.0
82.0
80.0
78.0
76.0
74.0
72.0
70.0
68.3
0 10 20 30 40 50 60 70 80 90 103
45 40 35 30 25 20 15 10 5 0
15 14 12 11 10 9 8 7 6 5 4 3 2 1 0

FIG. 59

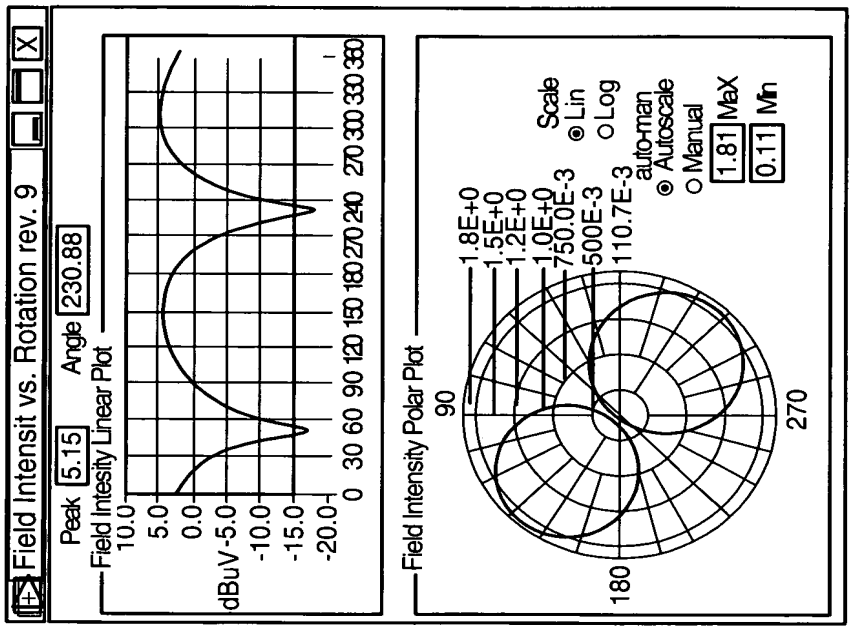

Field Intensit vs. Rotation rev. 9
Peak 5.15
Angle 230.88
Field Intesity Linear Plot
10.0
5.0
0.0
dBuV -5.0
-10.0
-15.0
-20.0
0 30 60 90 120 150 180 210 240 270 300 330 360
Field Intensity Polar Plot
90
180
270
1.8E+0
1.5E+0
1.2E+0
1.0E+0
750.0E-3
500E-3
110.7E-3
Scale
Lin
Log
auto-man
Autoscale
Manual
1.81 MaX
0.11 Mn

FIG. 60

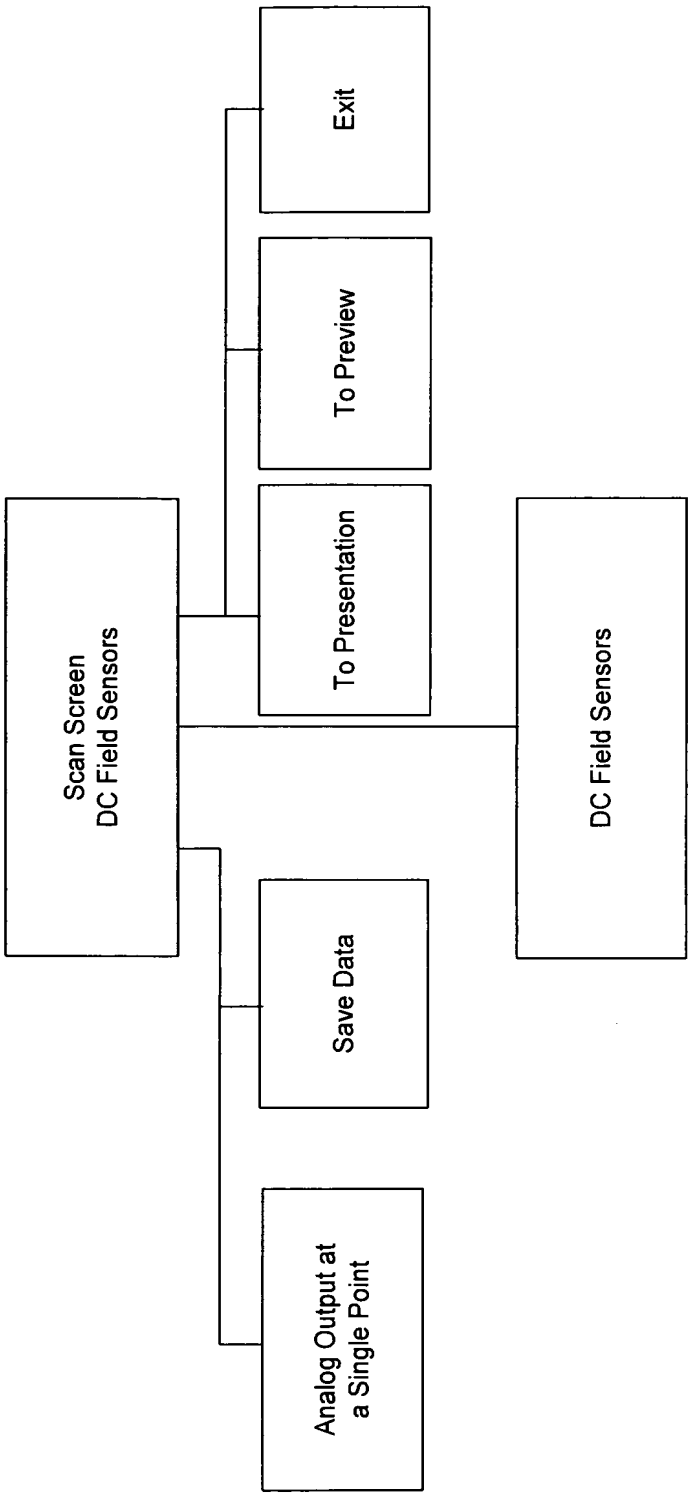

Exit
To Preview
To Presentation
Scan Screen
DC Field Sensors
DC Field Sensors
Save Data
Analog Output at
a Single Point

FIG. 61

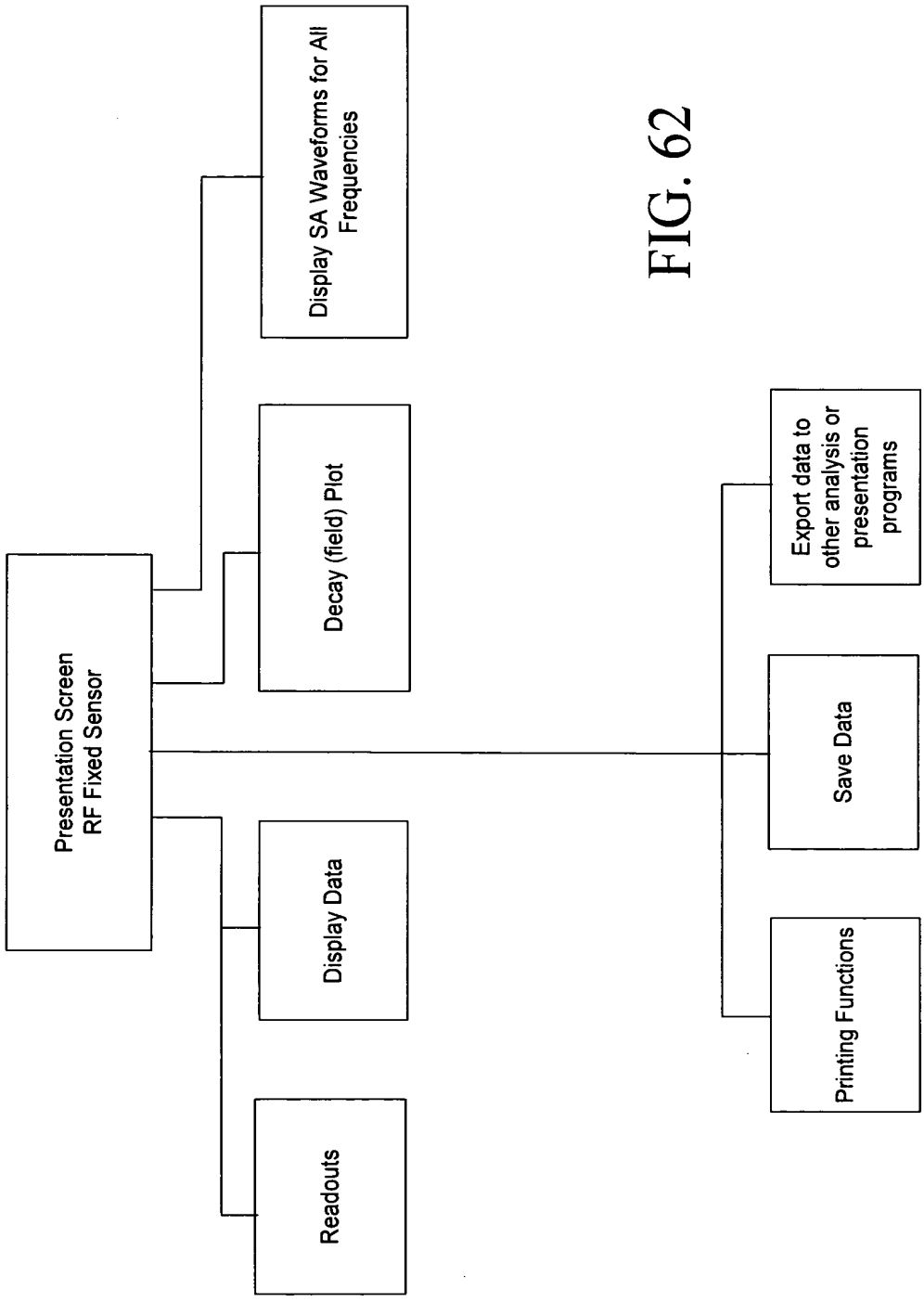

Presentation Screen
RF Fixed Sensor
Display SA Waveforms for All Frequencies
Decay (field) Plot
Display Data
Readouts
Save Data
Export data to other analysis or presentation programs
Printing Functions

FIG. 62

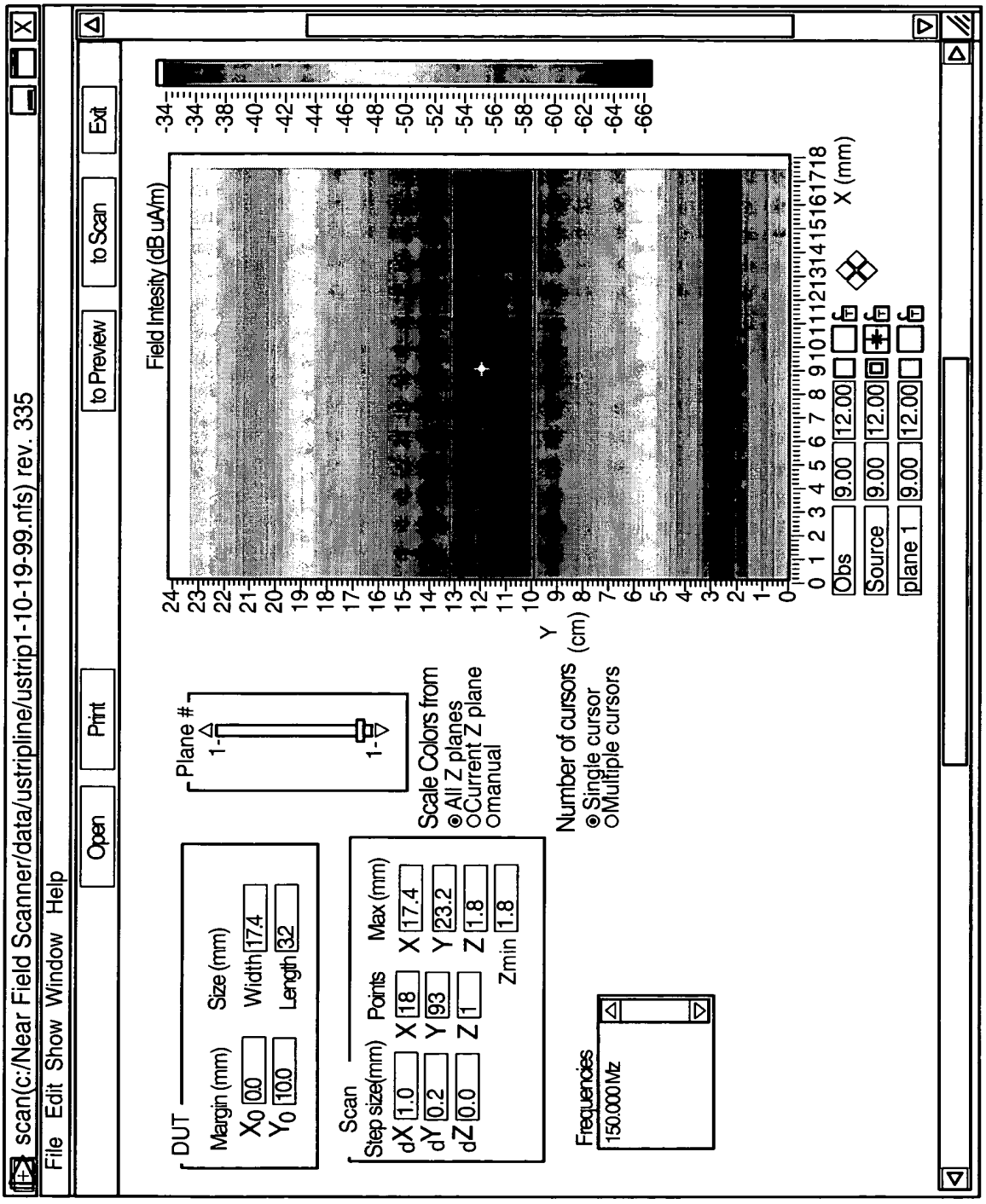

scan(c:/Near Field Scanner/data/ustripline/ustrip1-10-19-99.nfs) rev. 335
File Edit Show Window Help
Open
Print
to Preview
to Scan
Exit
Field Intesity (dB uA/m)
DUT
Margin (mm)
Size (mm)
Xo 0.0
Yo 10.0
Width 17.4
Length 32
Plane #
Scan
Step size(mm)
Points
Max (mm)
dX 1.0
X 18
X 17.4
dY 0.2
Y 93
Y 23.2
dZ 0.0
Z 1
Z 1.8
Zmin 1.8
Scale Colors from
All Z planes
Current Z plane
manual
Number of cursors
Single cursor
Multiple cursors
Frequencies
150.000Mz
Y (cm)
X (mm)
Obs 9.00 12.00
Source 9.00 12.00
plane 1 9.00 12.00

FIG. 63

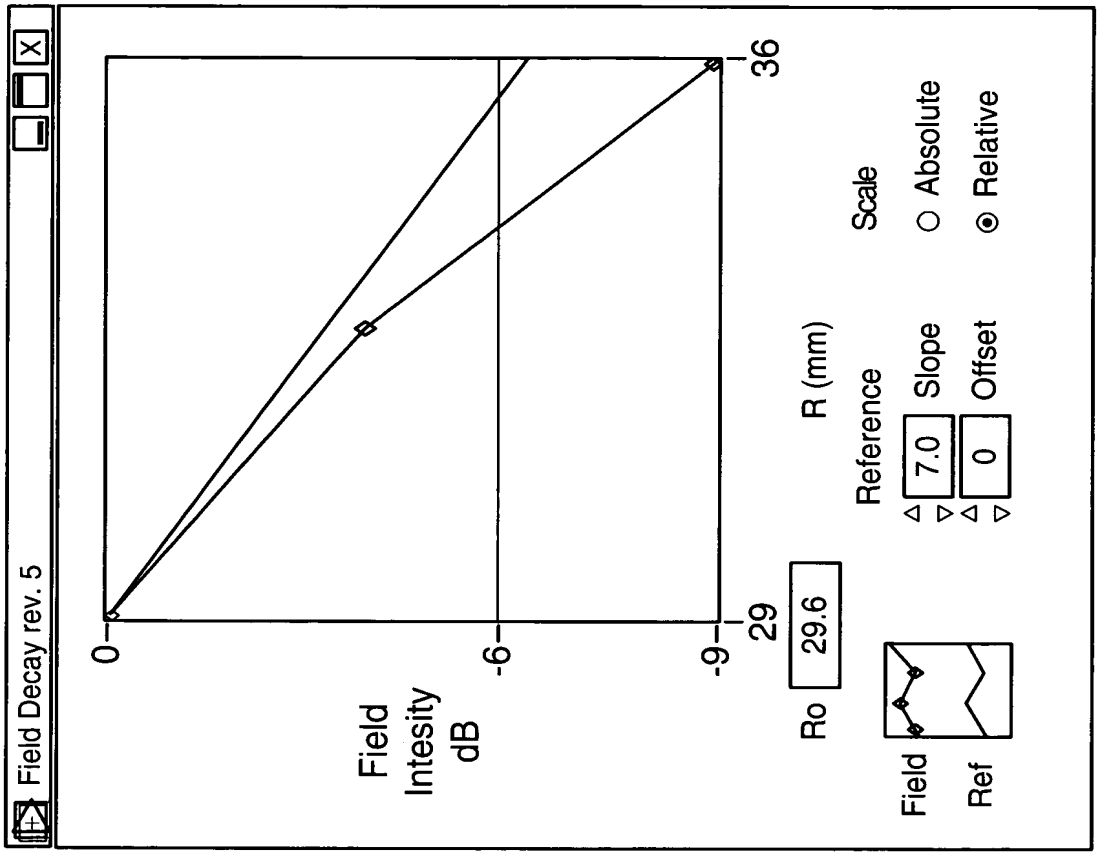

Field Decay rev. 5
Field Intesity dB
0
-6
-9
29
36
R (mm)
Ro
29.6
Reference
Scale
Absolute
Relative
Slope
7.0
Offset
0
Field
Ref

FIG. 64

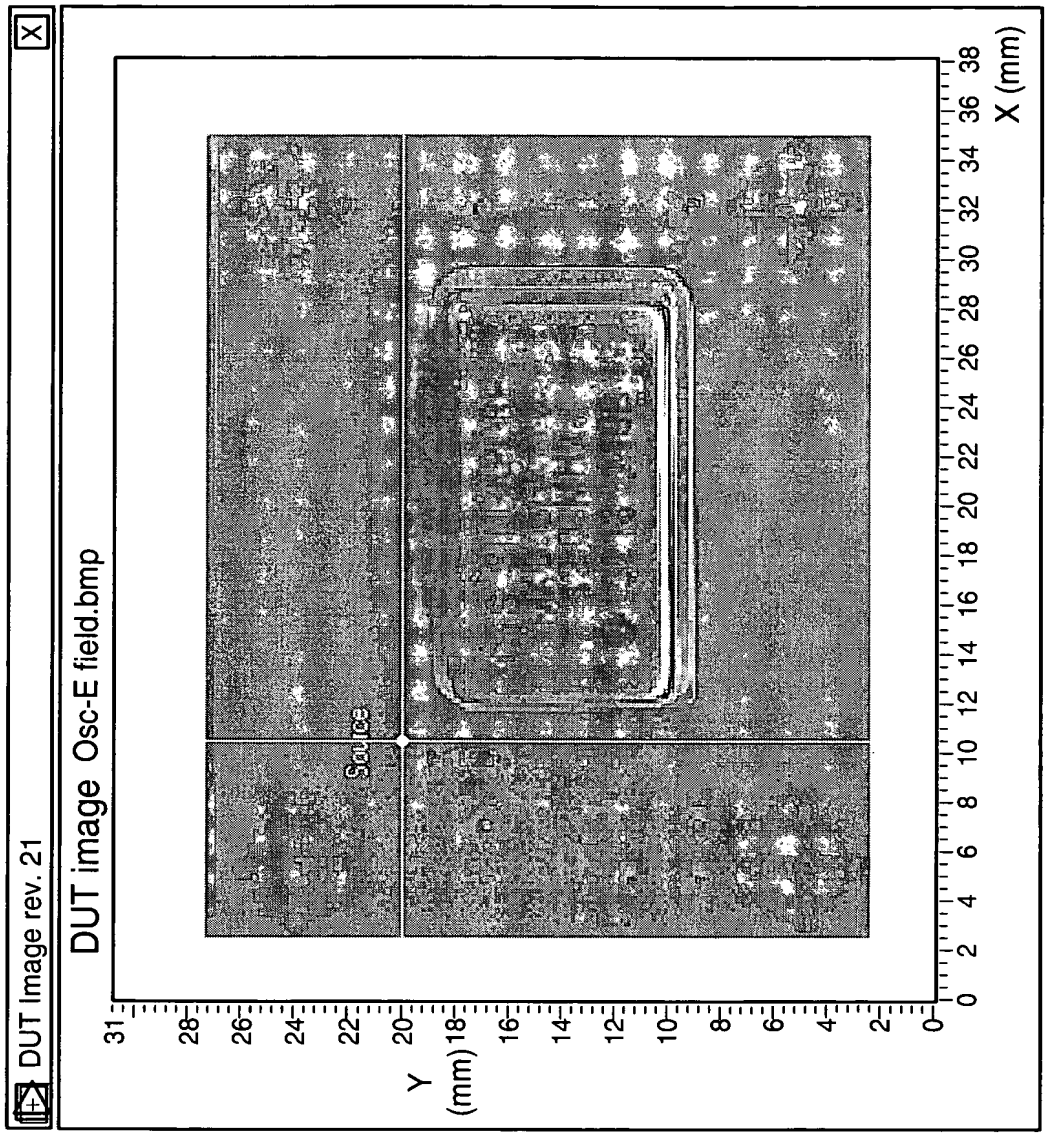

DUT Image rev. 21
DUT image Osc-E field.bmp
Source
Y (mm)
X (mm)
0
2
4
6
8
10
12
14
16
18
20
22
24
26
28
30
31
32
34
36
38

FIG. 65

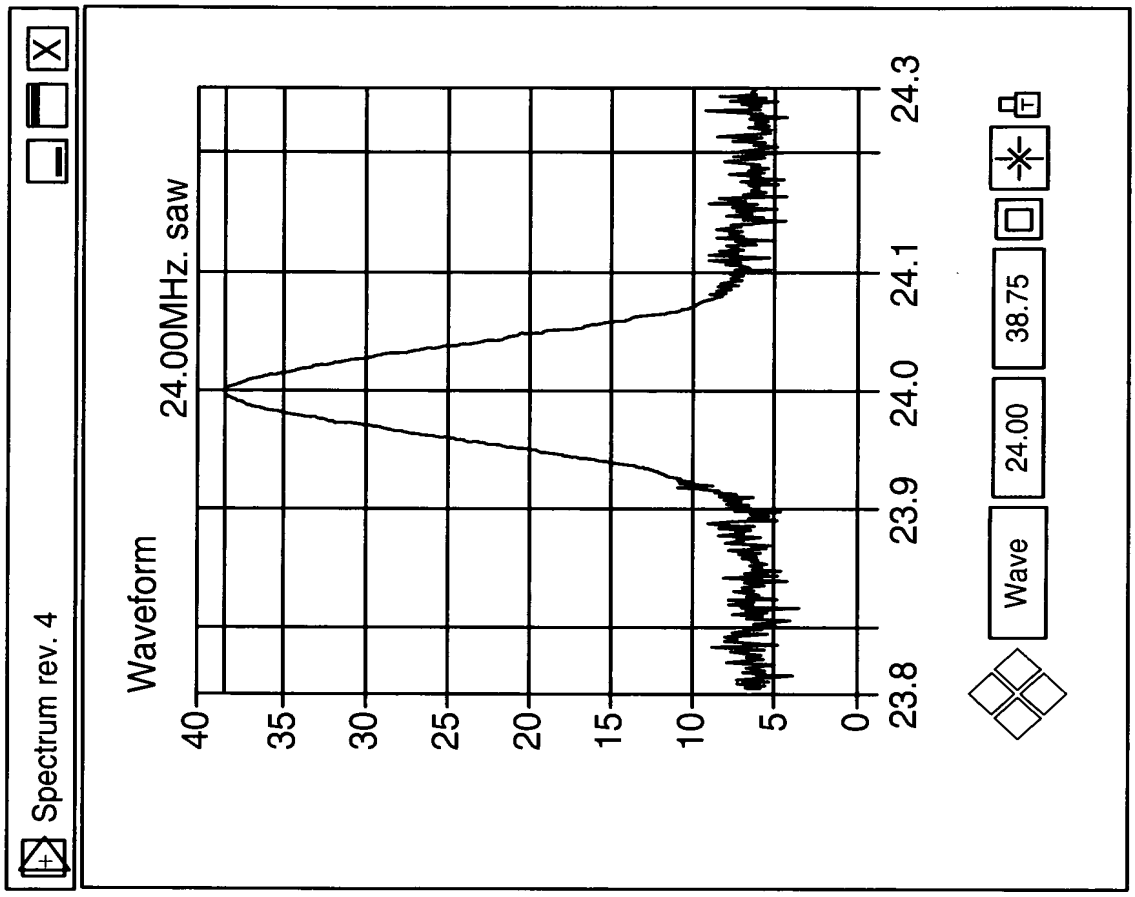

Spectrum rev. 4
Waveform
24.00MHz. saw
40
35
30
25
20
15
10
5
0
23.8
23.9
24.0
24.1
24.3
Wave
24.00
38.75

FIG. 66

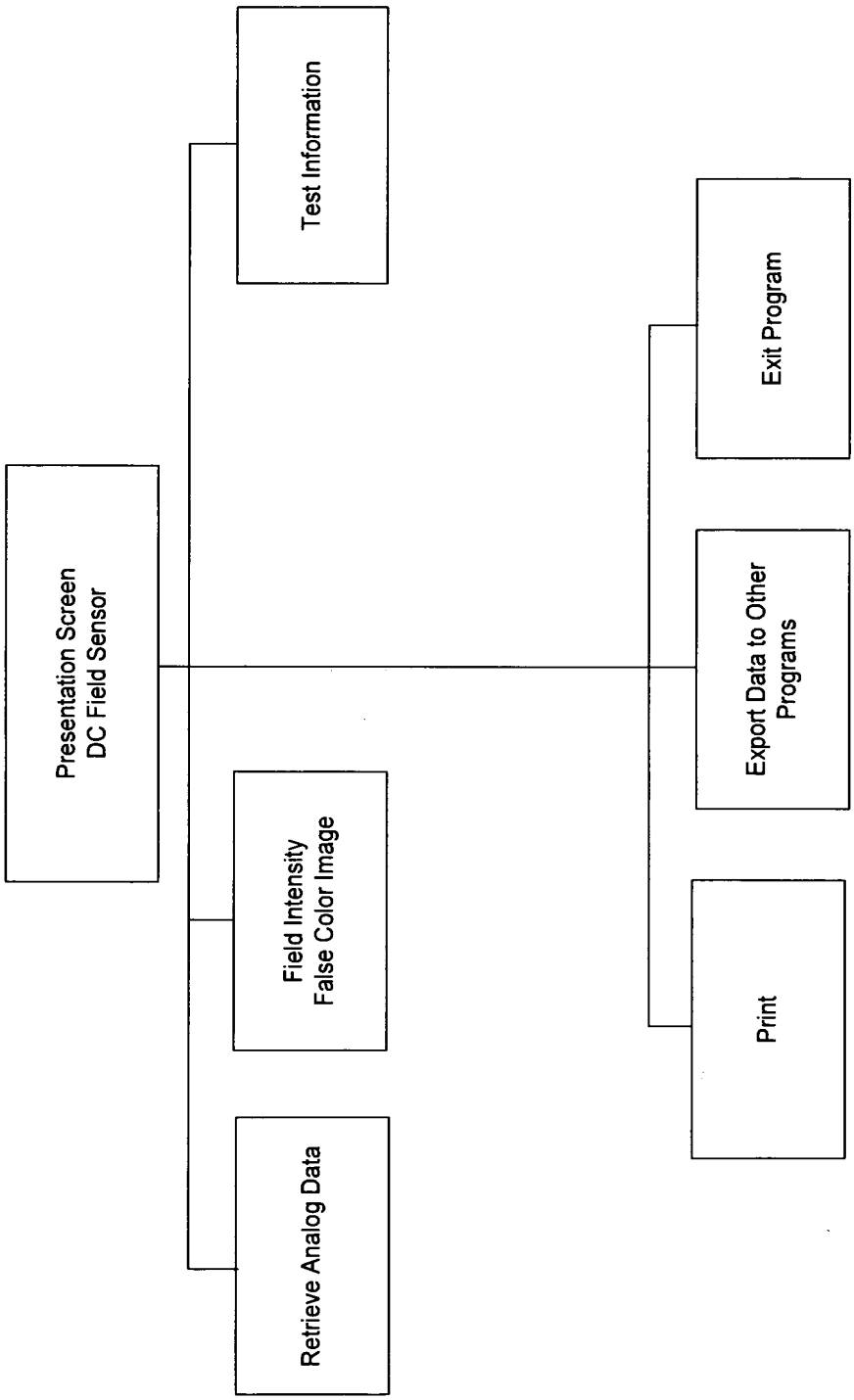

Presentation Screen
DC Field Sensor
Test Information
Field Intensity
False Color Image
Retrieve Analog Data
Exit Program
Export Data to Other
Programs
Print

FIG. 67

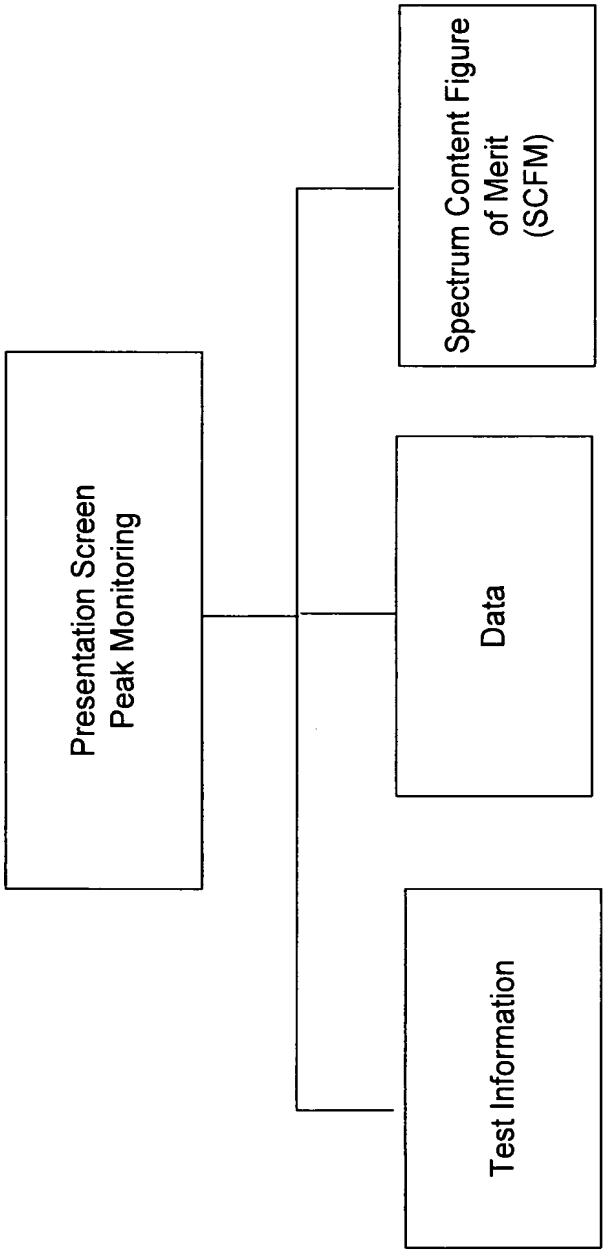

Presentation Screen
Peak Monitoring
Spectrum Content Figure of Merit (SCFM)
Data
Test Information

FIG. 68

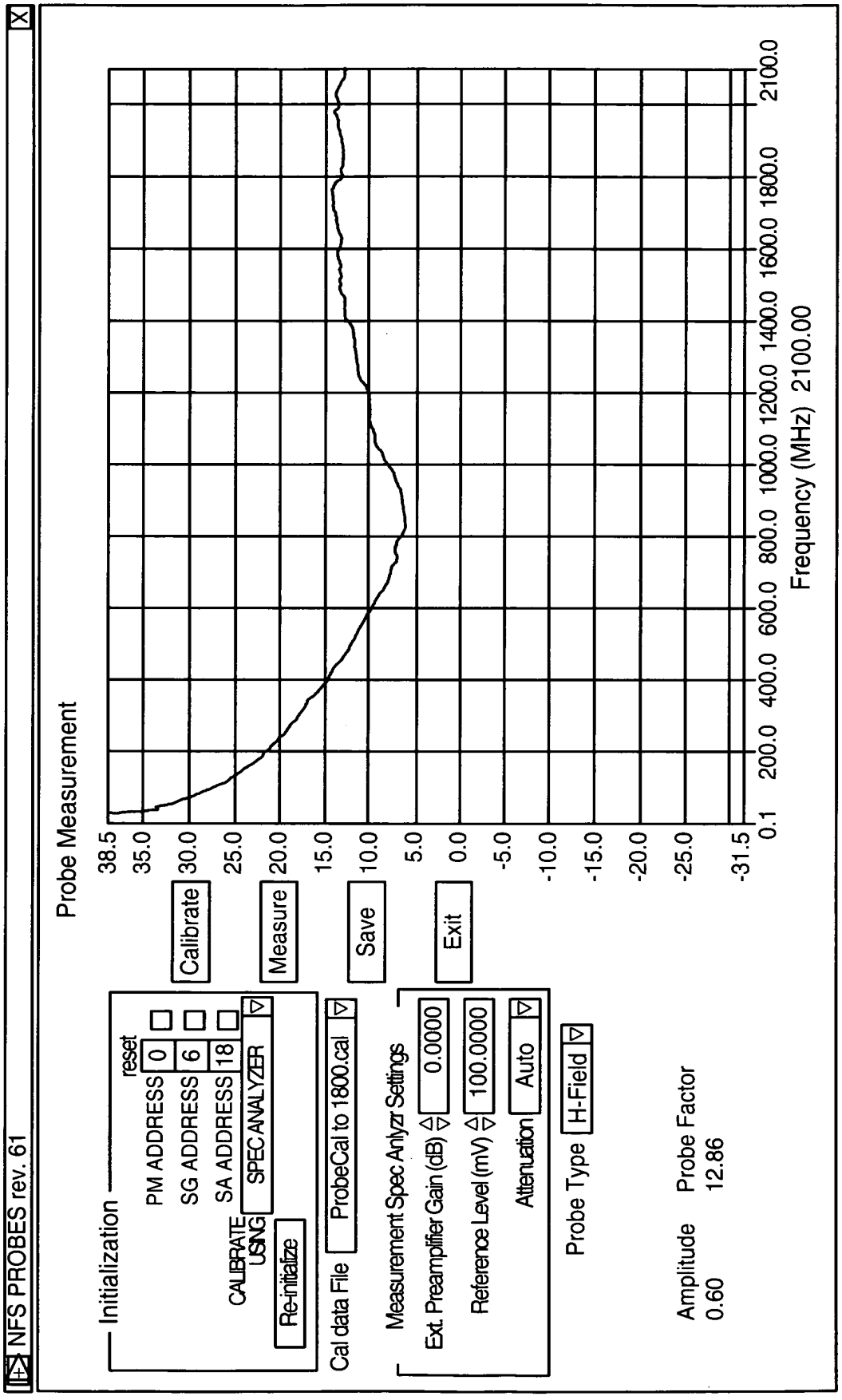

NFS PROBES rev. 61
Probe Measurement
Initialization
reset
PM ADDRESS 0
SG ADDRESS 6
SA ADDRESS 18
CALIBRATE USING SPEC ANALYZER
Re-initialize
Cal data File ProbeCal to 1800.cal
Measurement Spec Anlyzr Settings
Ext. Preamplifier Gain (dB) 0.0000
Reference Level (mV) 100.0000
Attenuation Auto
Probe Type H-Field
Amplitude 0.60
Probe Factor 12.86
Calibrate
Measure
Save
Exit
38.5
35.0
30.0
25.0
20.0
15.0
10.0
5.0
0.0
-5.0
-10.0
-15.0
-20.0
-25.0
-31.5
0.1 200.0 400.0 600.0 800.0 1000.0 1200.0 1400.0 1600.0 1800.0 2100.0
Frequency (MHz) 2100.00

FIG. 69

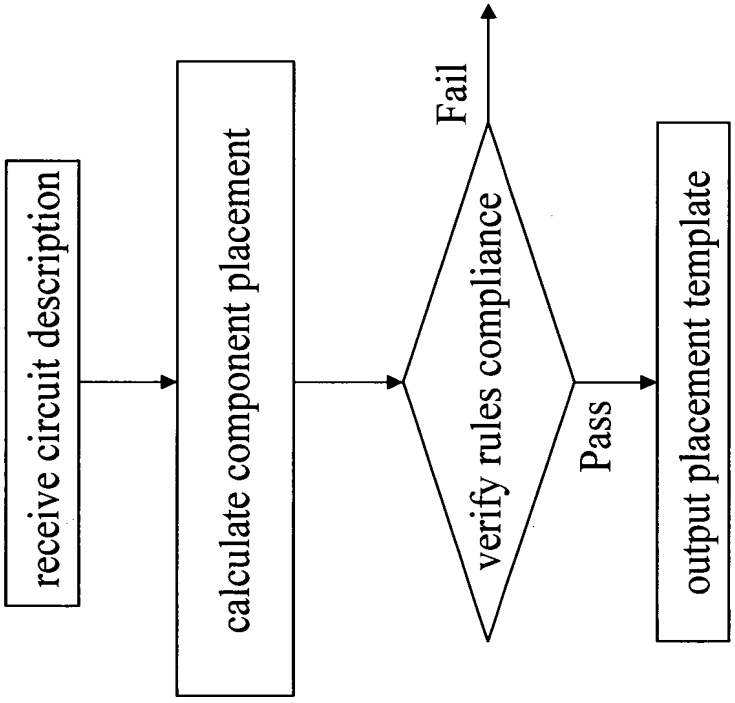


FIG. 70 (RELATED ART)

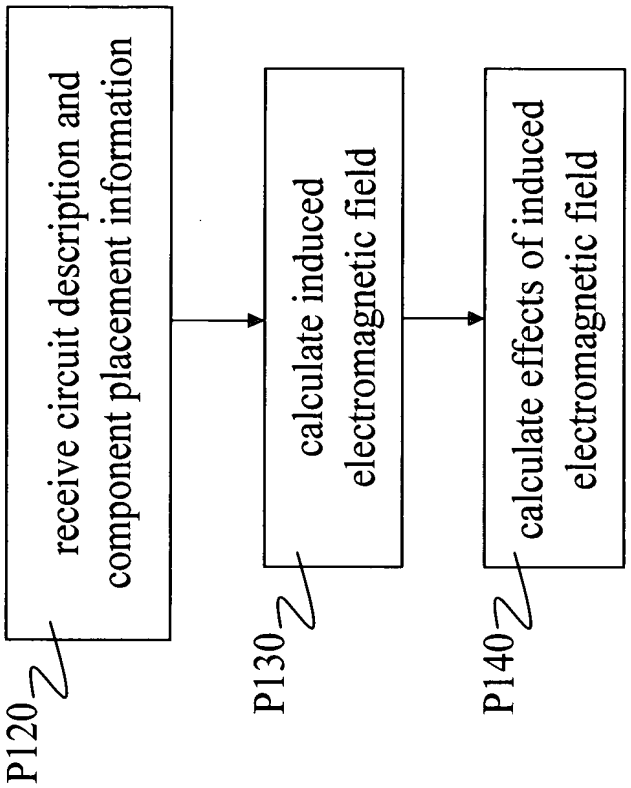

receive circuit description and component placement information
P120
calculate induced electromagnetic field
P130
calculate effects of induced electromagnetic field
P140

FIG. 71

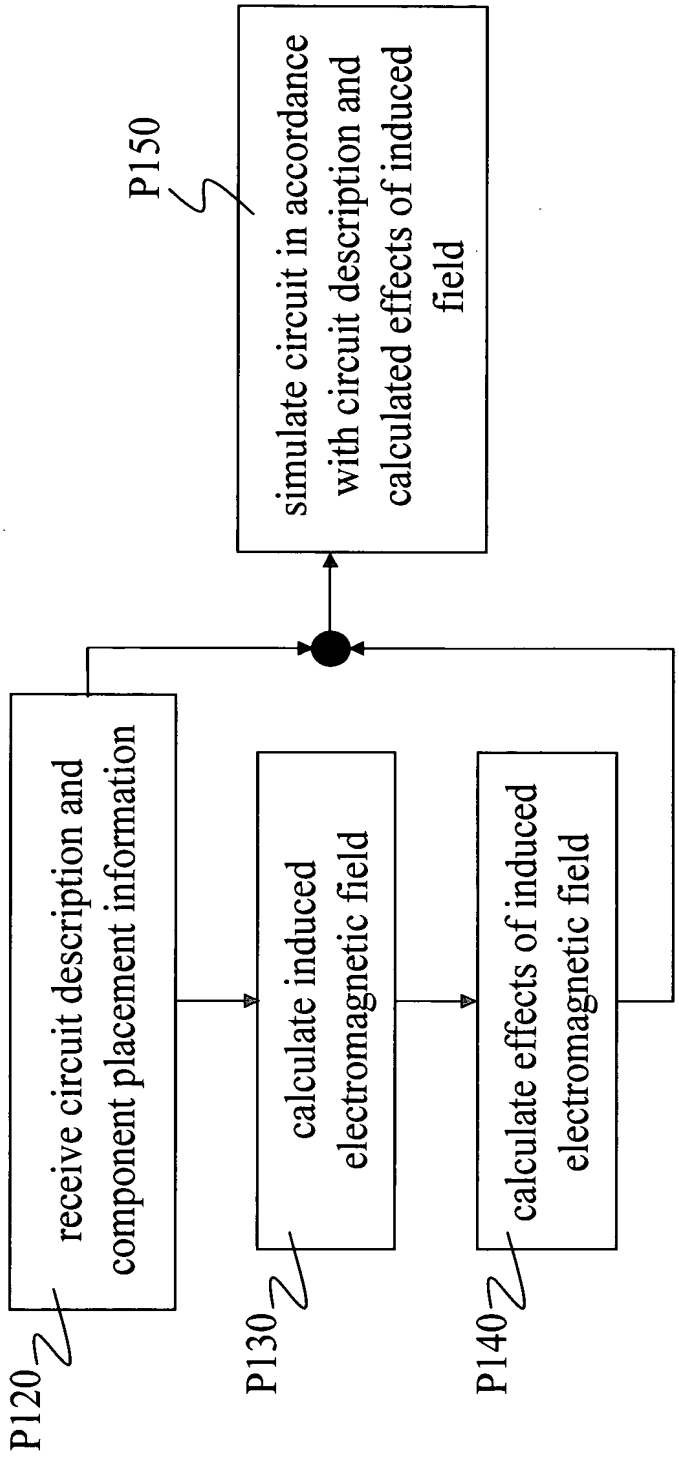

P150
simulate circuit in accordance with circuit description and calculated effects of induced field
receive circuit description and component placement information
P120
calculate induced electromagnetic field
P130
calculate effects of induced electromagnetic field
P140

FIG. 72

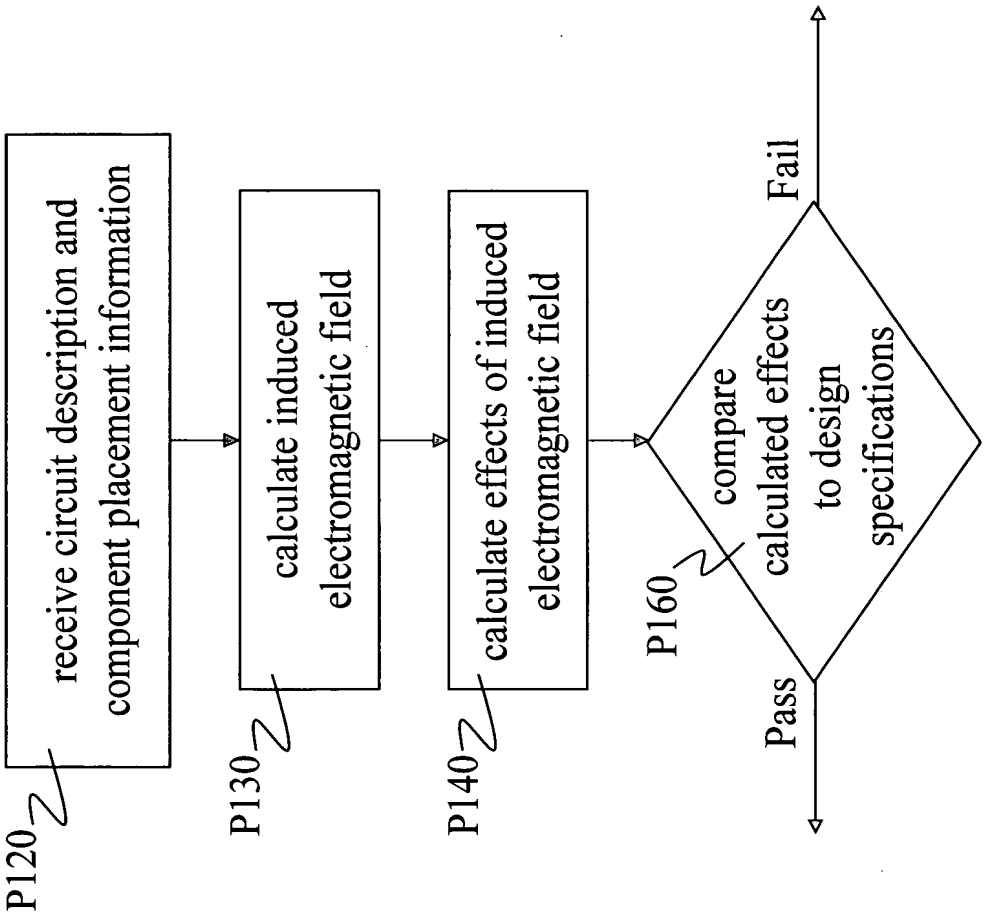

P120
receive circuit description and component placement information
P130
calculate induced electromagnetic field
P140
calculate effects of induced electromagnetic field
P160
compare calculated effects to design specifications
Fail
Pass

FIG. 73

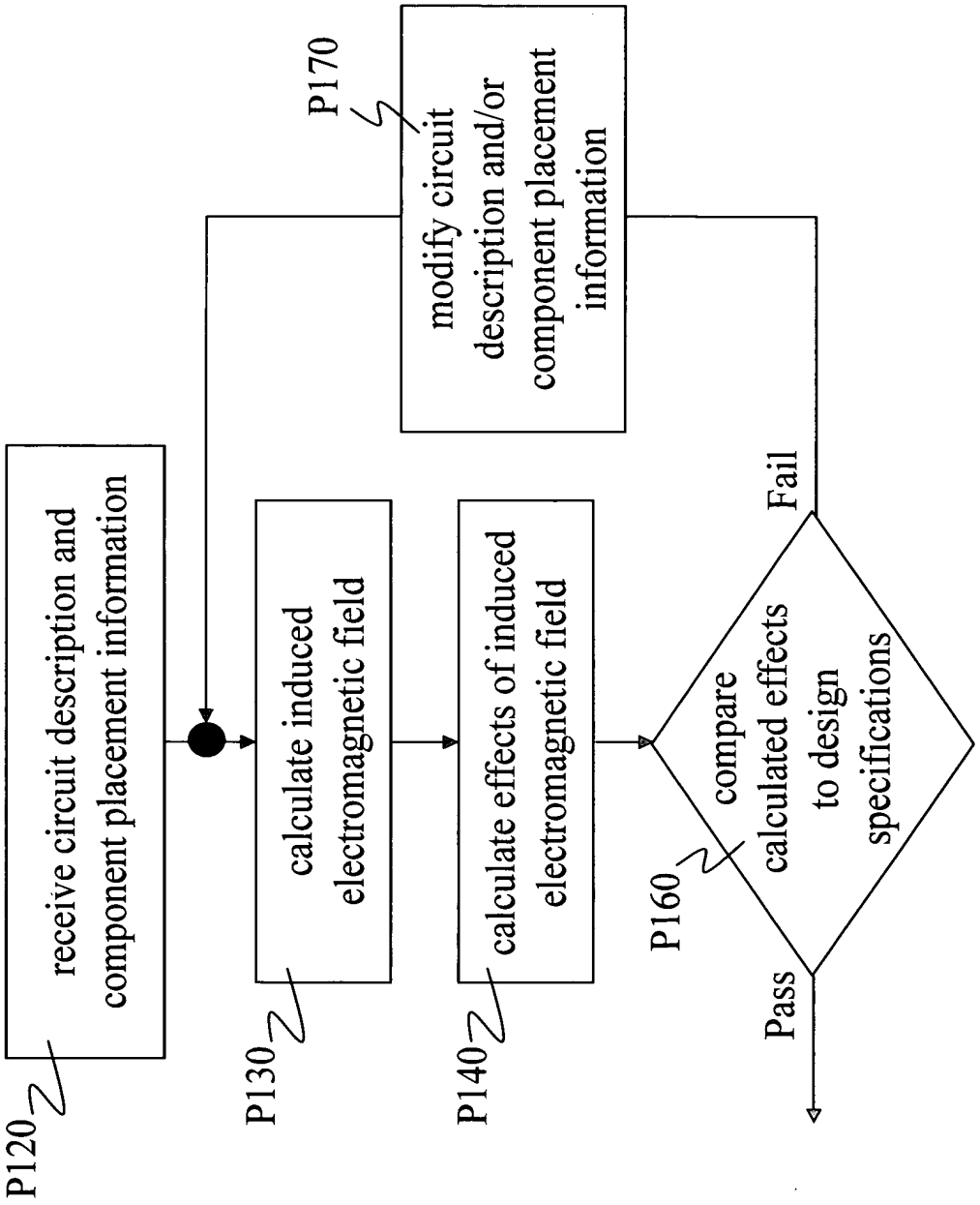

receive circuit description and component placement information
P120
calculate induced electromagnetic field
P130
calculate effects of induced electromagnetic field
P140
compare calculated effects to design specifications
P160
Fail
Pass
modify circuit description and/or component placement information
P170

FIG. 74

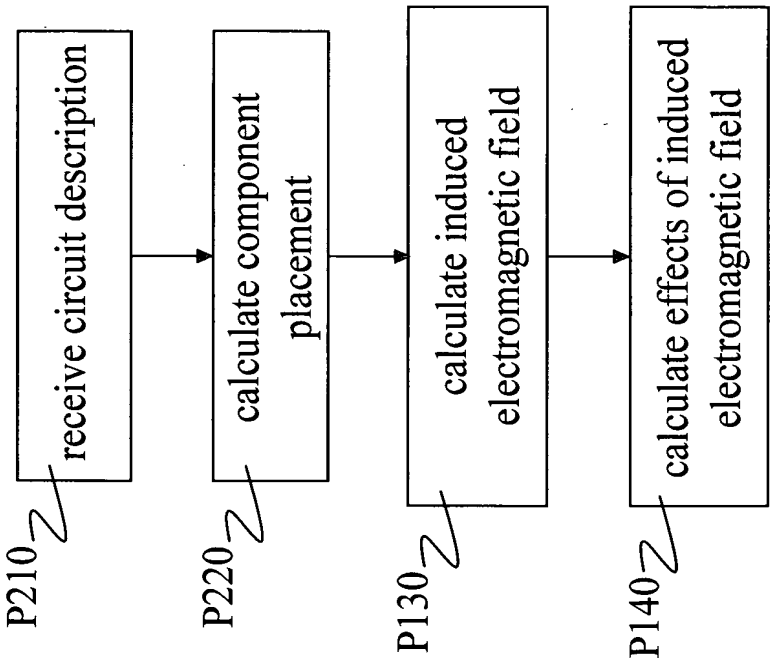

receive circuit description
calculate component placement
calculate induced electromagnetic field
calculate effects of induced electromagnetic field
P210
P220
P130
P140

FIG. 75

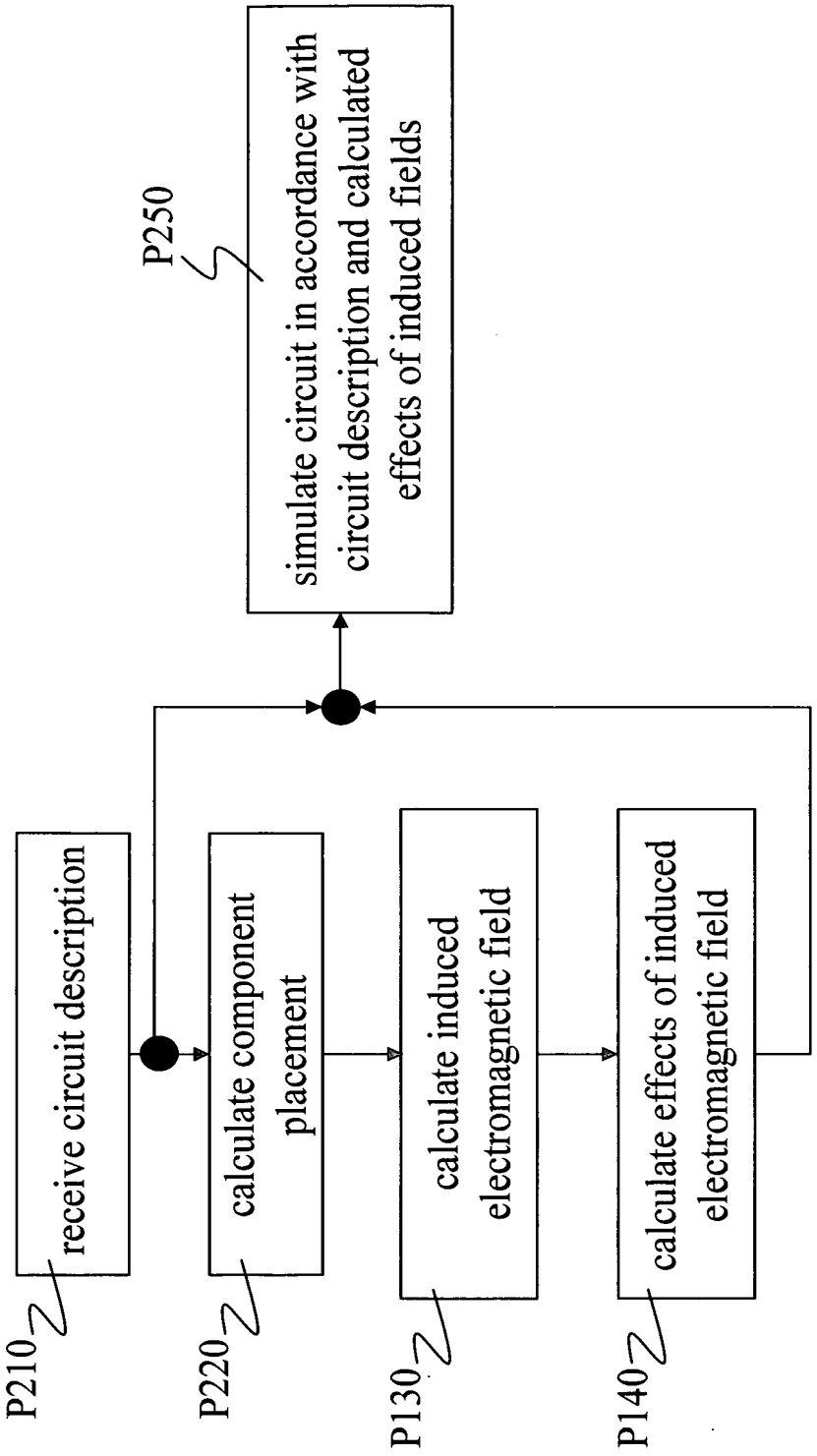

P250
simulate circuit in accordance with circuit description and calculated effects of induced fields
P210
receive circuit description
P220
calculate component placement
P130
calculate induced electromagnetic field
P140
calculate effects of induced electromagnetic field

FIG. 76

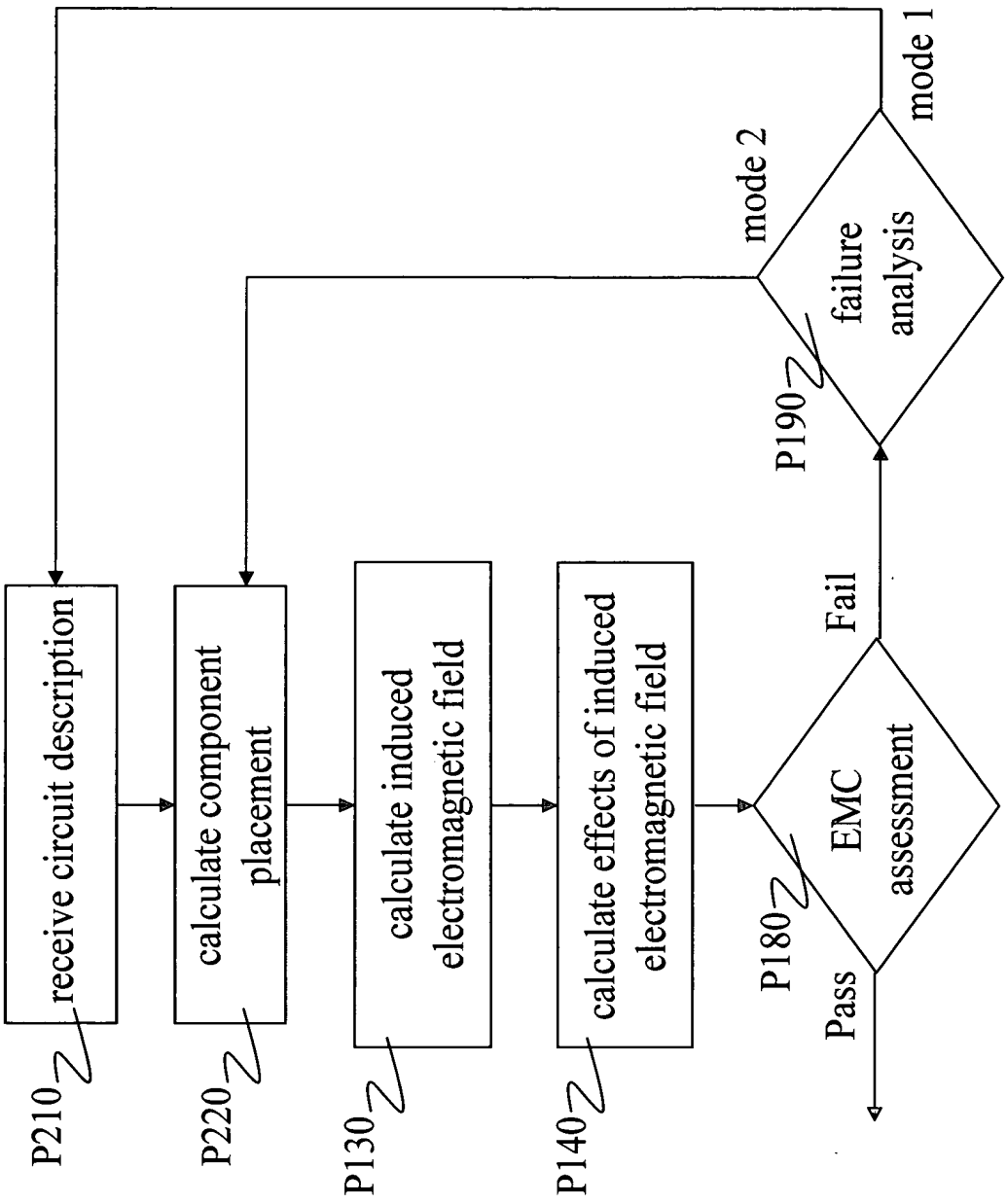

receive circuit description
calculate component placement
calculate induced electromagnetic field
calculate effects of induced electromagnetic field
EMC assessment
Pass
Fail
failure analysis
mode 2
mode 1
P210
P220
P130
P140
P180
P190

FIG. 77

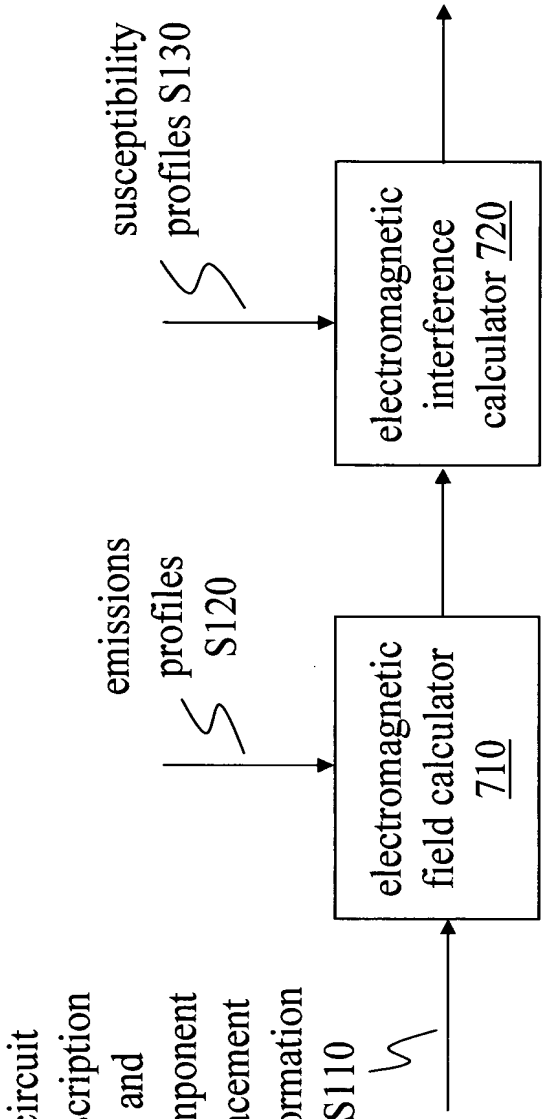

circuit description and component placement information S110
emissions profiles S120
susceptibility profiles S130
electromagnetic field calculator 710
electromagnetic interference calculator 720

FIG. 78

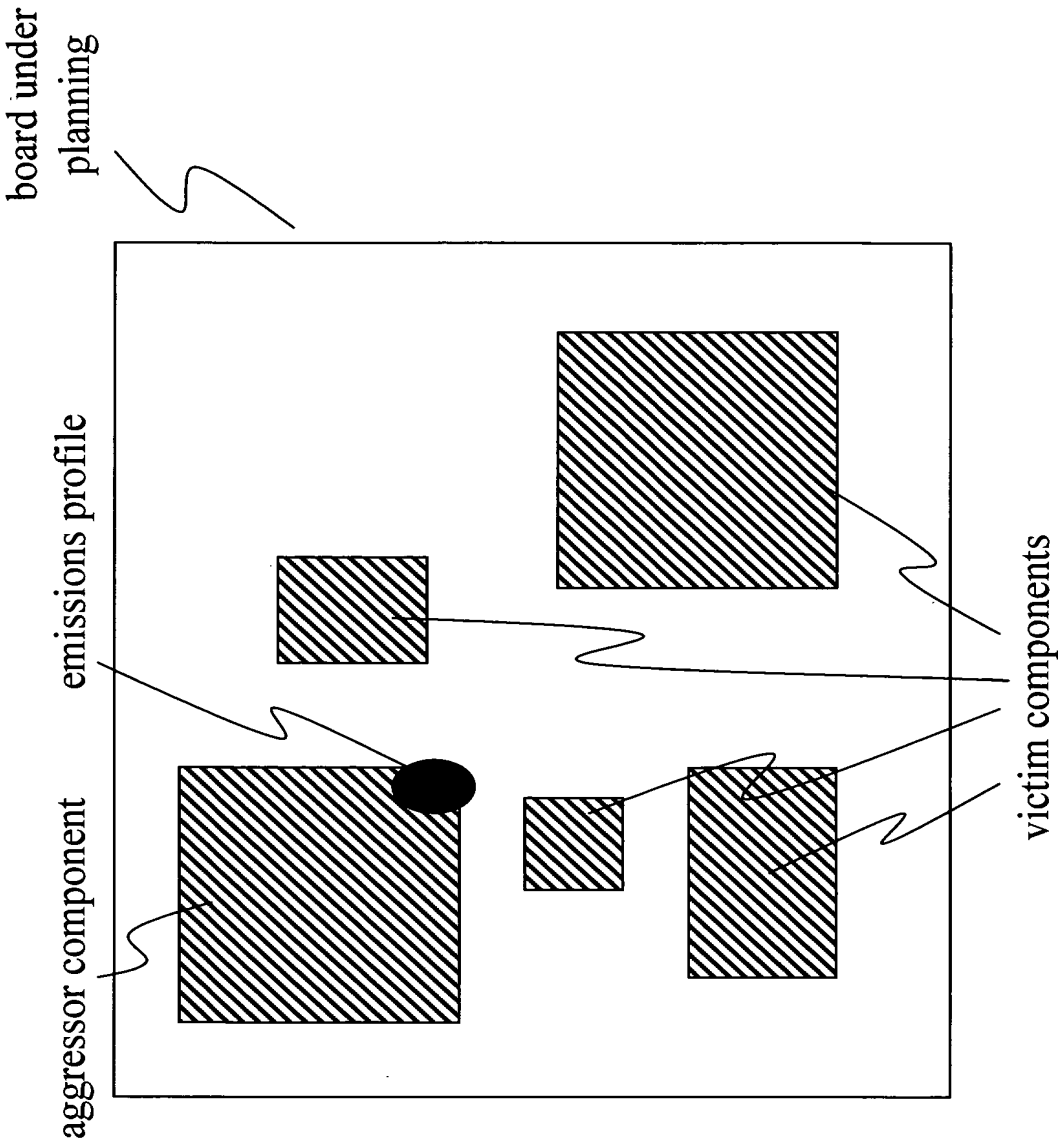

board under planning
emissions profile
aggressor component
victim components

FIG. 79

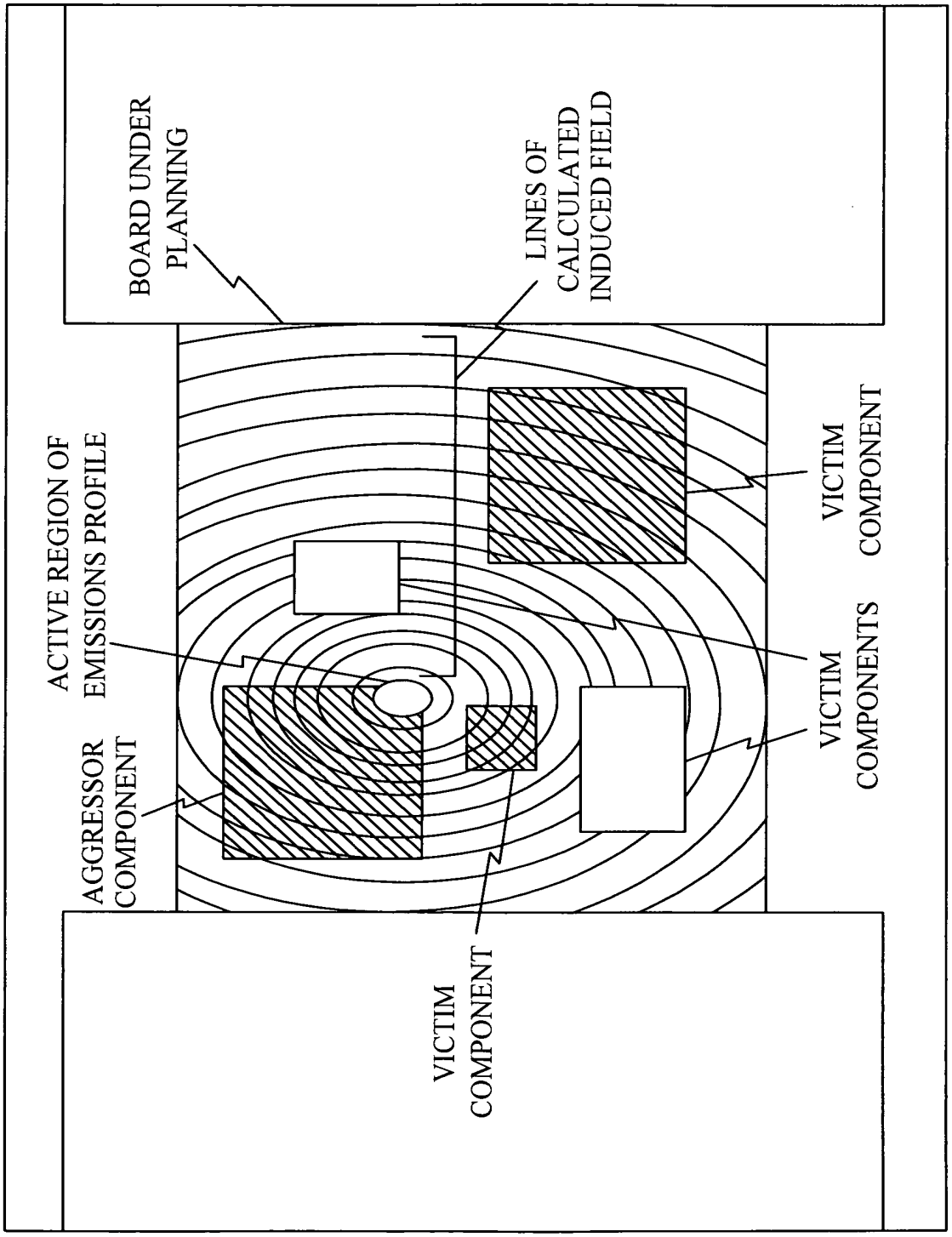

BOARD UNDER PLANNING
LINES OF CALCULATED INDUCED FIELD
ACTIVE REGION OF EMISSIONS PROFILE
AGGRESSOR COMPONENT
VICTIM COMPONENT
VICTIM COMPONENTS
VICTIM COMPONENT

FIG. 80

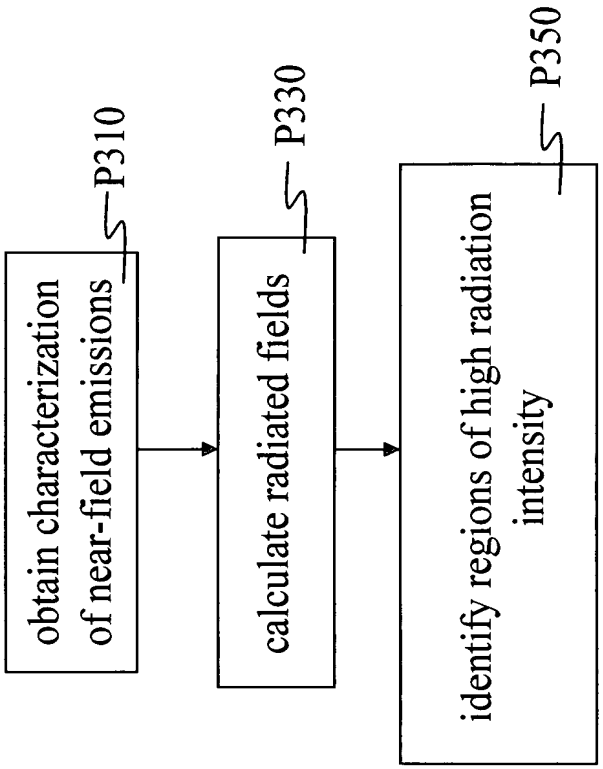

obtain characterization of near-field emissions
P310
calculate radiated fields
P330
identify regions of high radiation intensity
P350

FIG. 81

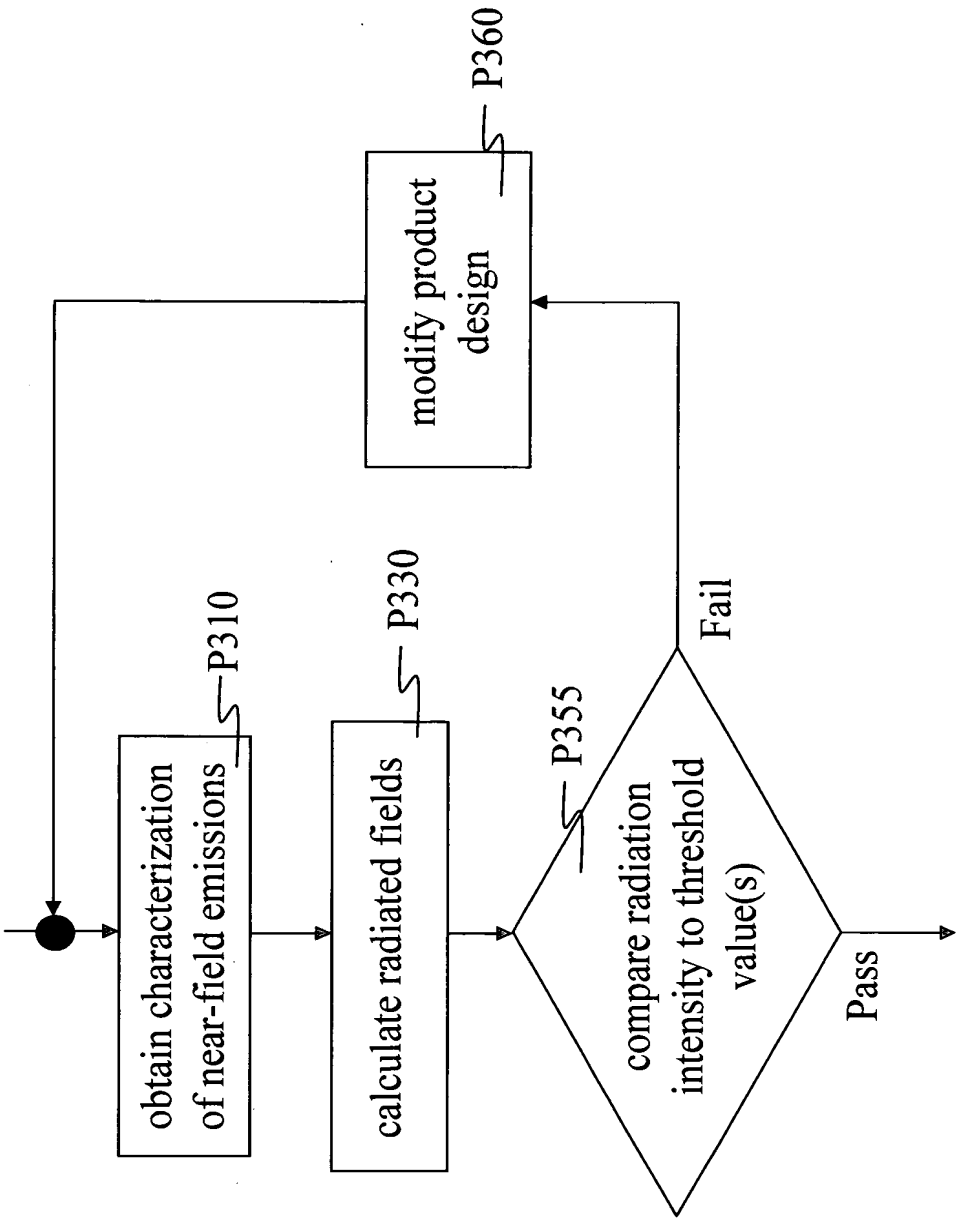

obtain characterization of near-field emissions
P310
calculate radiated fields
P330
compare radiation intensity to threshold value(s)
P355
Fail
Pass
modify product design
P360

FIG. 82

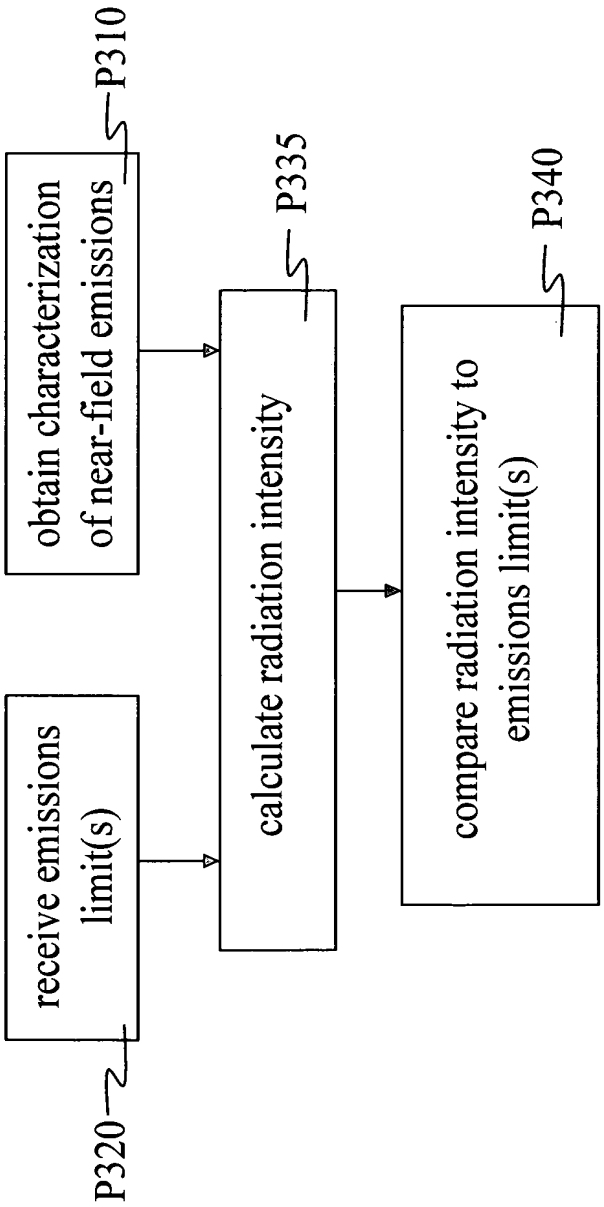

receive emissions limit(s)
obtain characterization of near-field emissions
calculate radiation intensity
compare radiation intensity to emissions limit(s)
P320
P310
P335
P340

FIG. 83

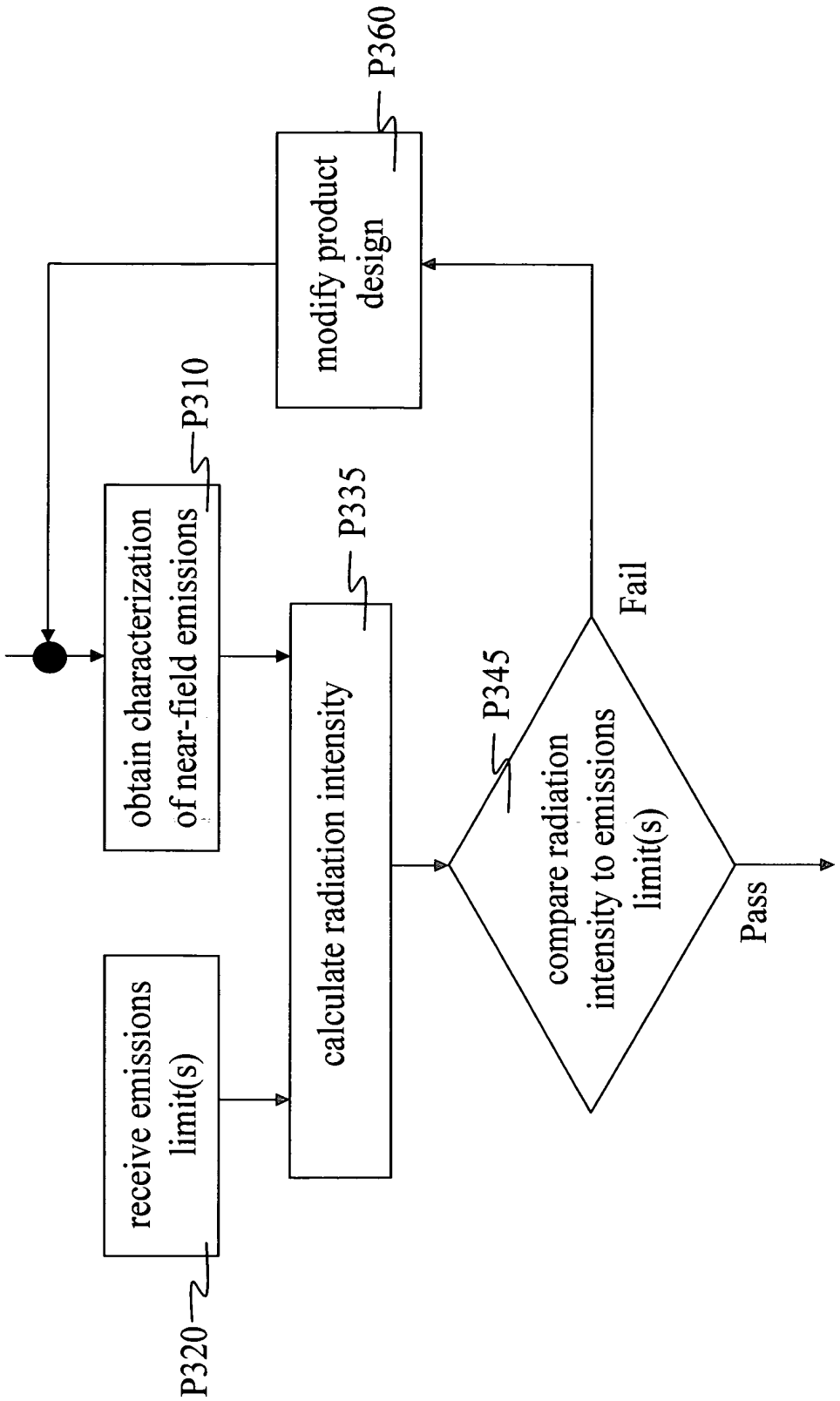

receive emissions limit(s)
P320
obtain characterization of near-field emissions
P310
calculate radiation intensity
P335
compare radiation intensity to emissions limit(s)
P345
Fail
Pass
modify product design
P360

FIG. 84

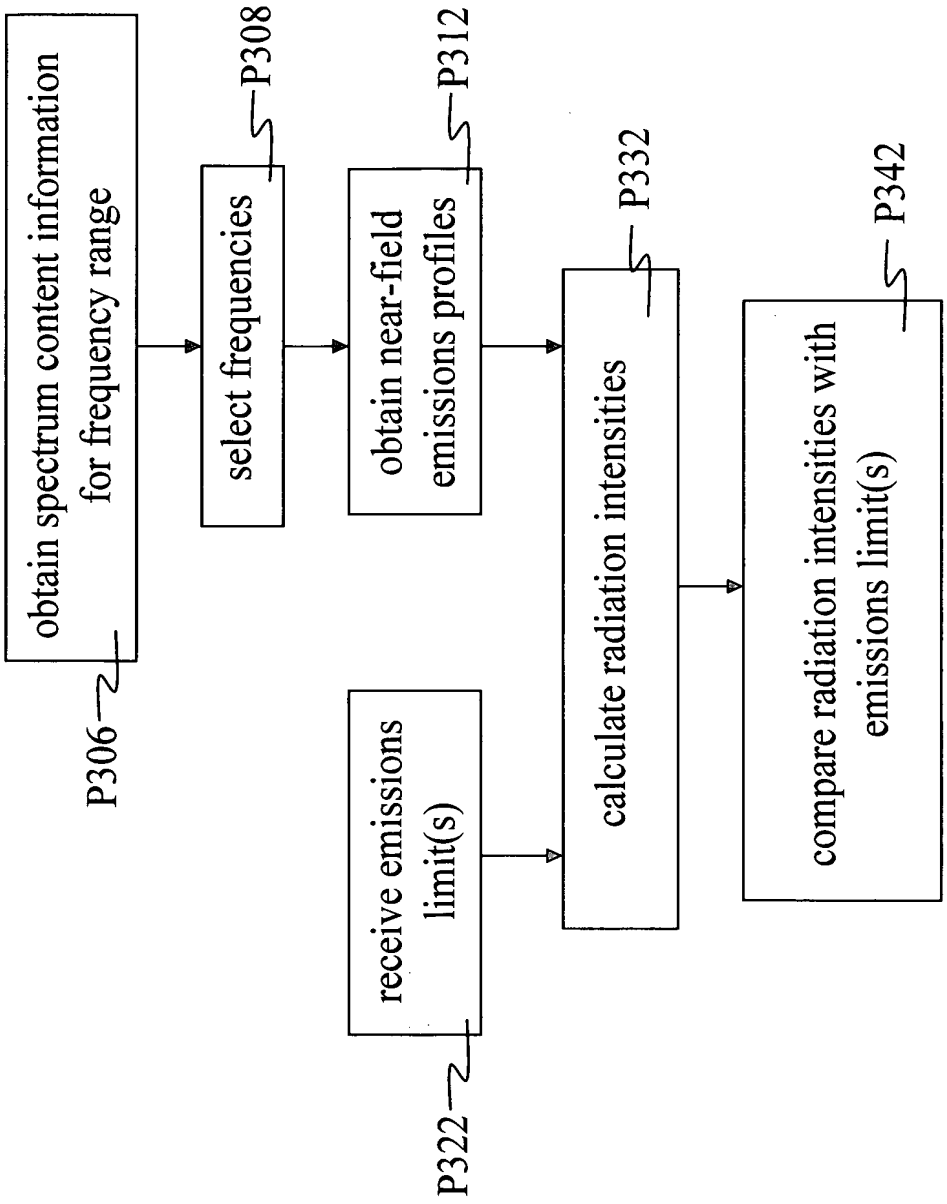

obtain spectrum content information for frequency range
P306
select frequencies
P308
obtain near-field emissions profiles
P312
receive emissions limit(s)
P322
calculate radiation intensities
P332
compare radiation intensities with emissions limit(s)
P342

FIG. 85

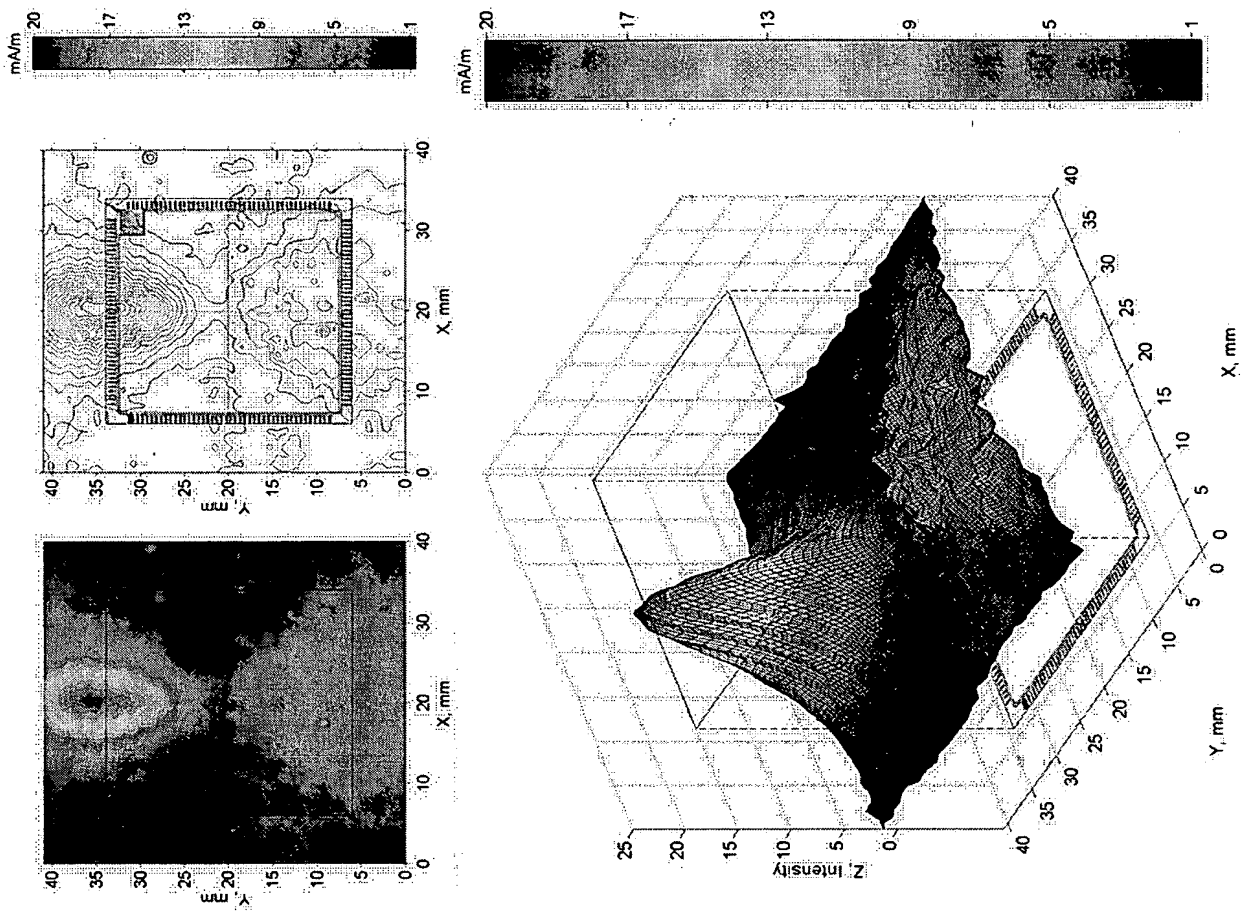


FIG. 86

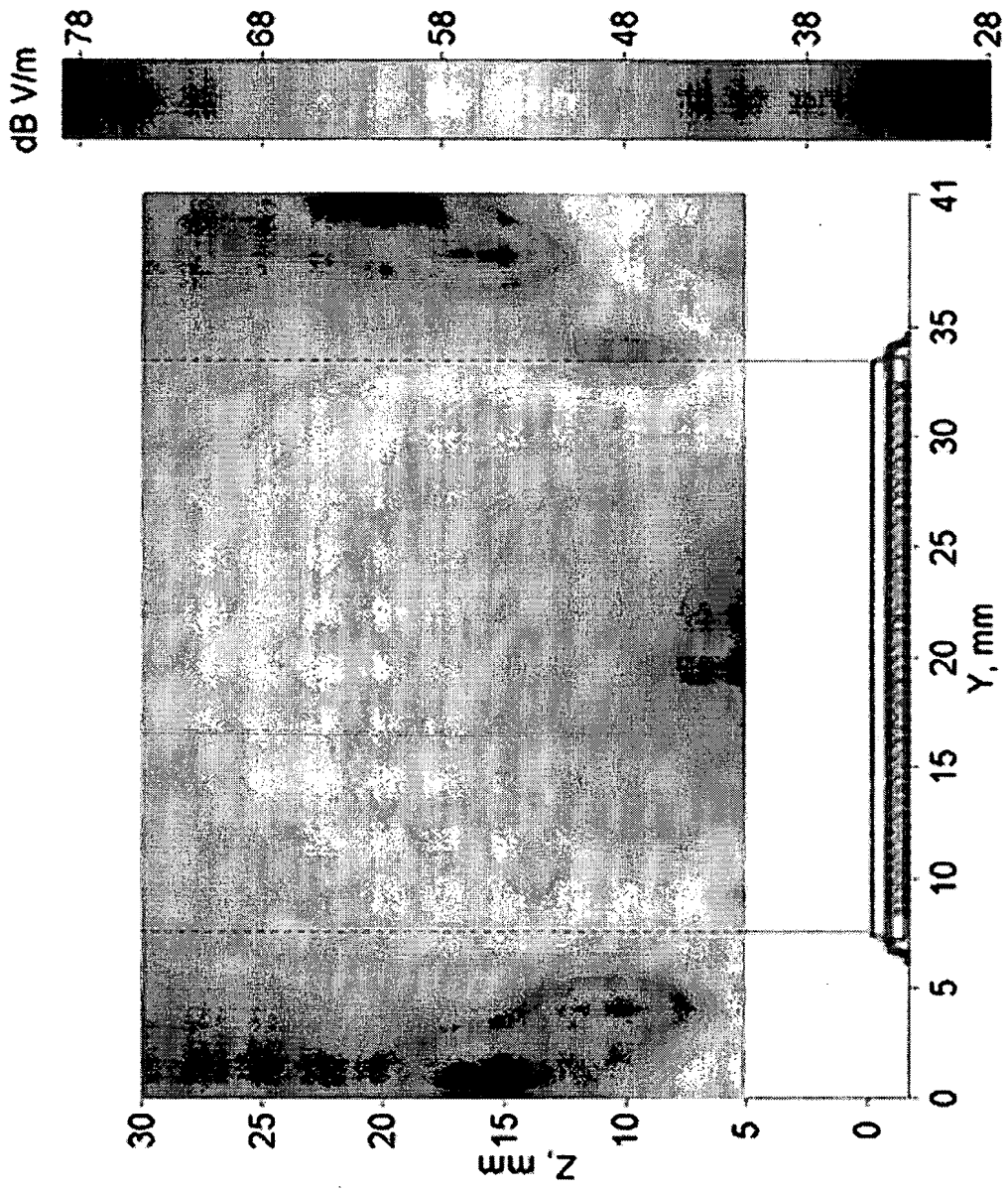

dB V/m
78
68
58
48
38
28
Z, mm
30
25
20
15
10
5
0
Y, mm
0
5
10
15
20
25
30
35
41

FIG. 87

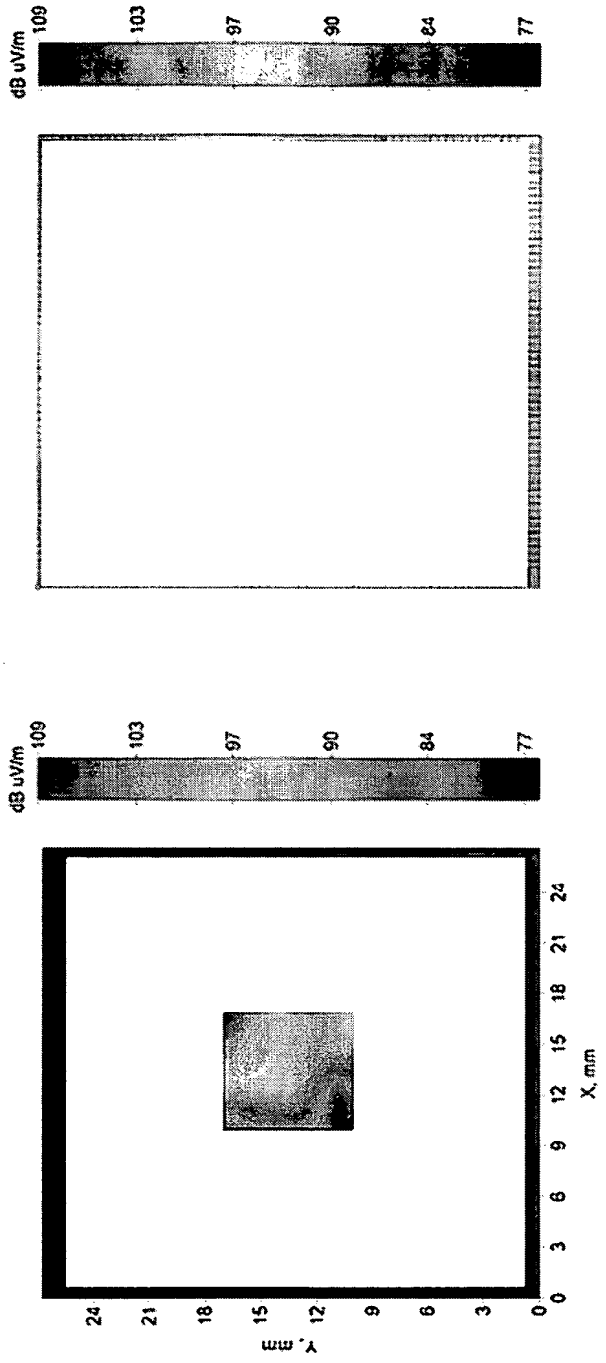

dB uV/m
109
103
97
90
84
77
dB uV/m
109
103
97
90
84
77
Y, mm
0
3
6
9
12
15
18
21
24
X, mm
0
3
6
9
12
15
18
21
24

FIG. 88

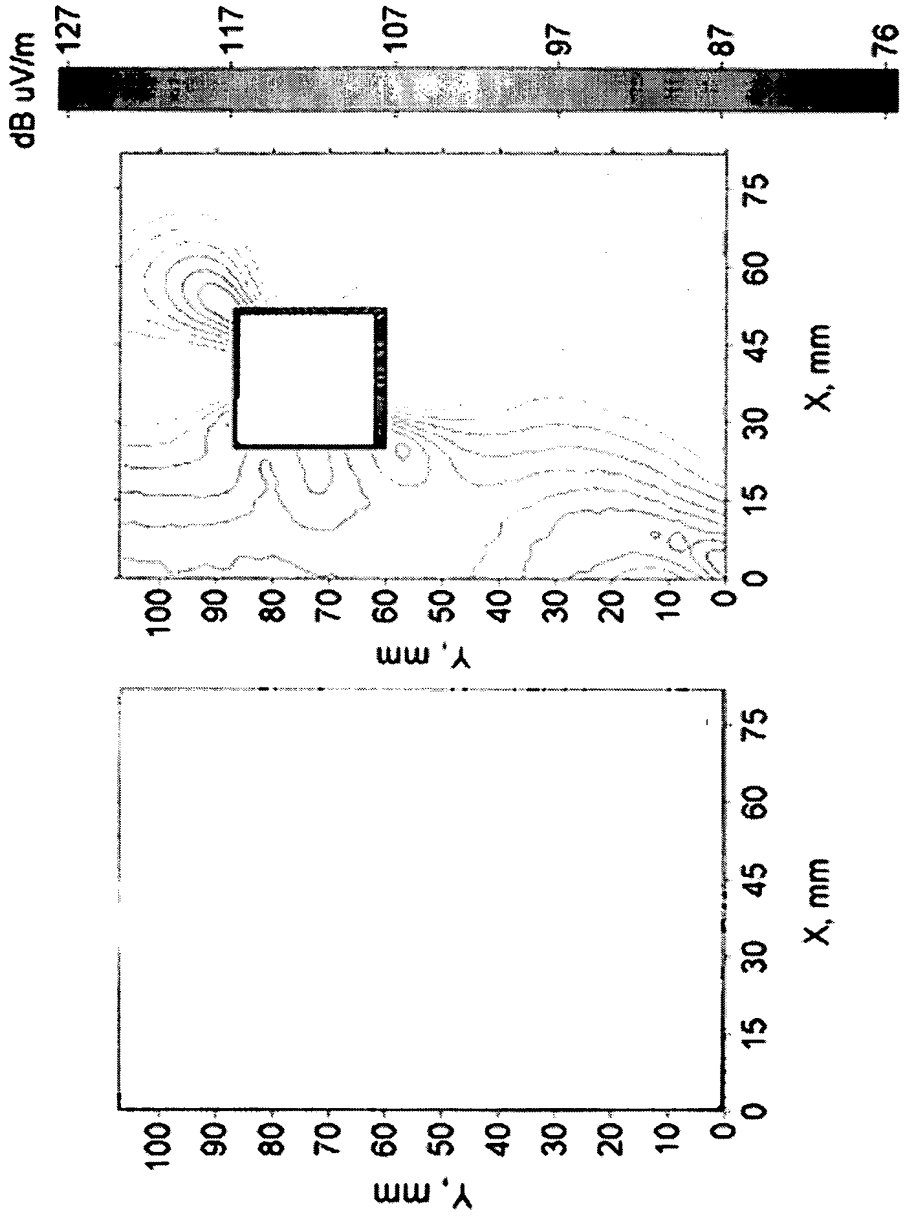

dB uV/m
127
117
107
97
87
76
Y, mm
X, mm
0
10
20
30
40
50
60
70
80
90
100
0
15
30
45
60
75

FIG. 89

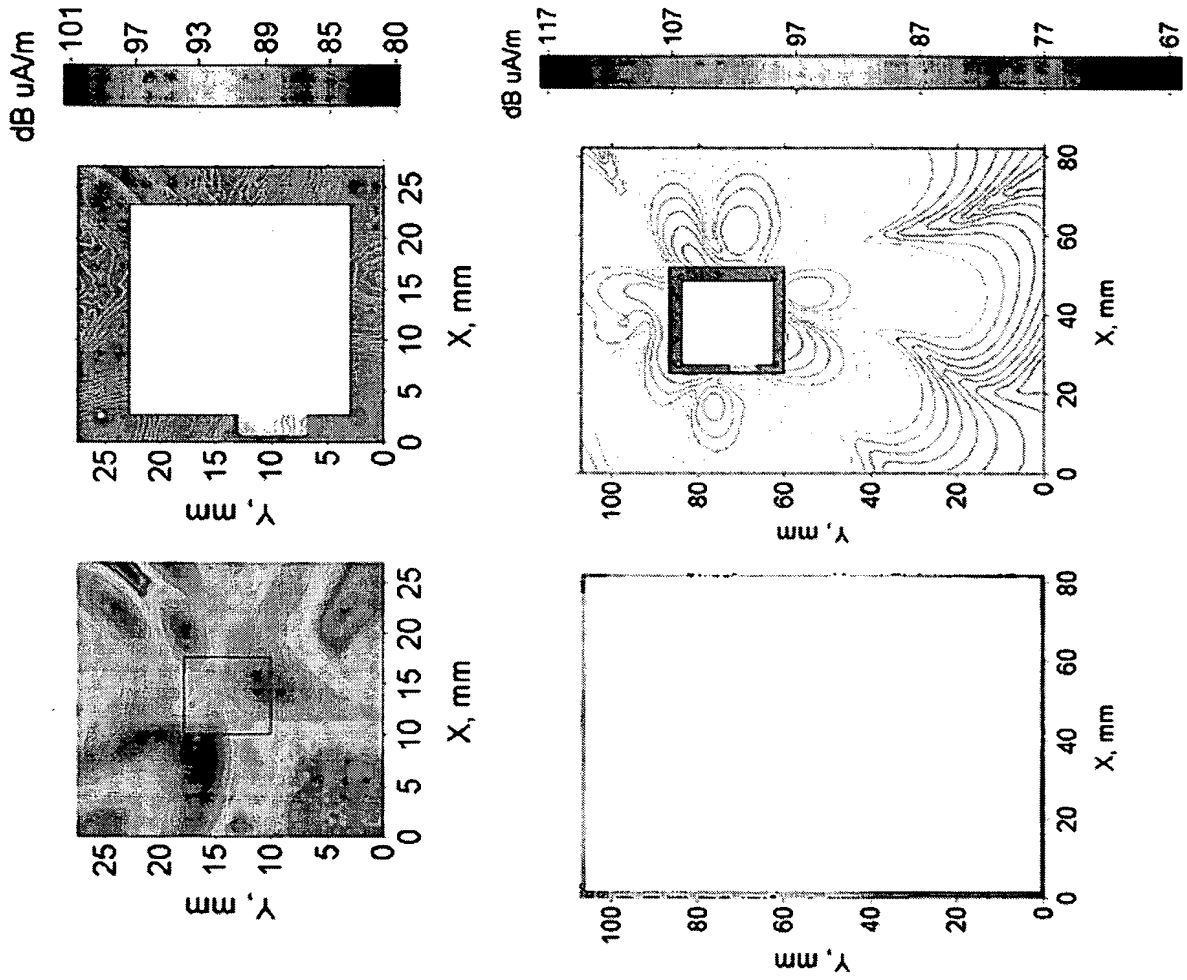

dB uA/m
101
97
93
89
85
80
Y, mm
X, mm
0
5
10
15
20
25
dB uA/m
117
107
97
87
77
67
Y, mm
X, mm
0
20
40
60
80
100

FIG. 90

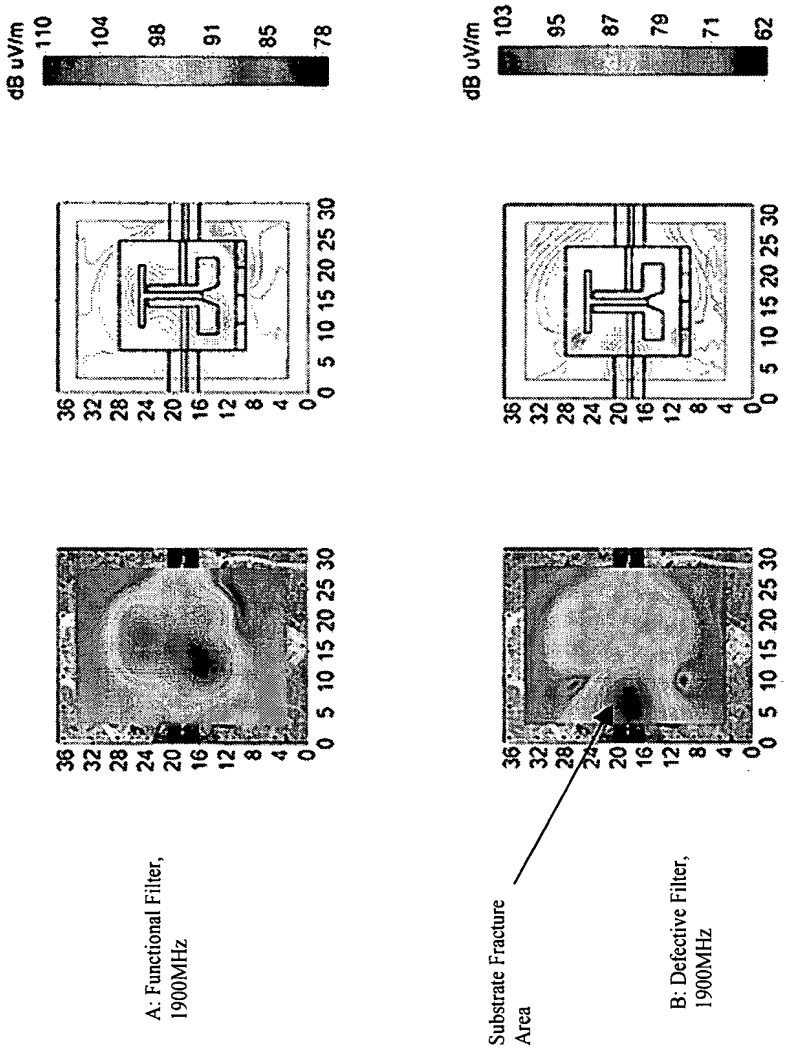

dB uV/m
110
104
98
91
85
78
dB uV/m
103
95
87
79
71
62
A: Functional Filter, 1900MHz
Substrate Fracture Area
B: Defective Filter, 1900MHz

FIG. 91

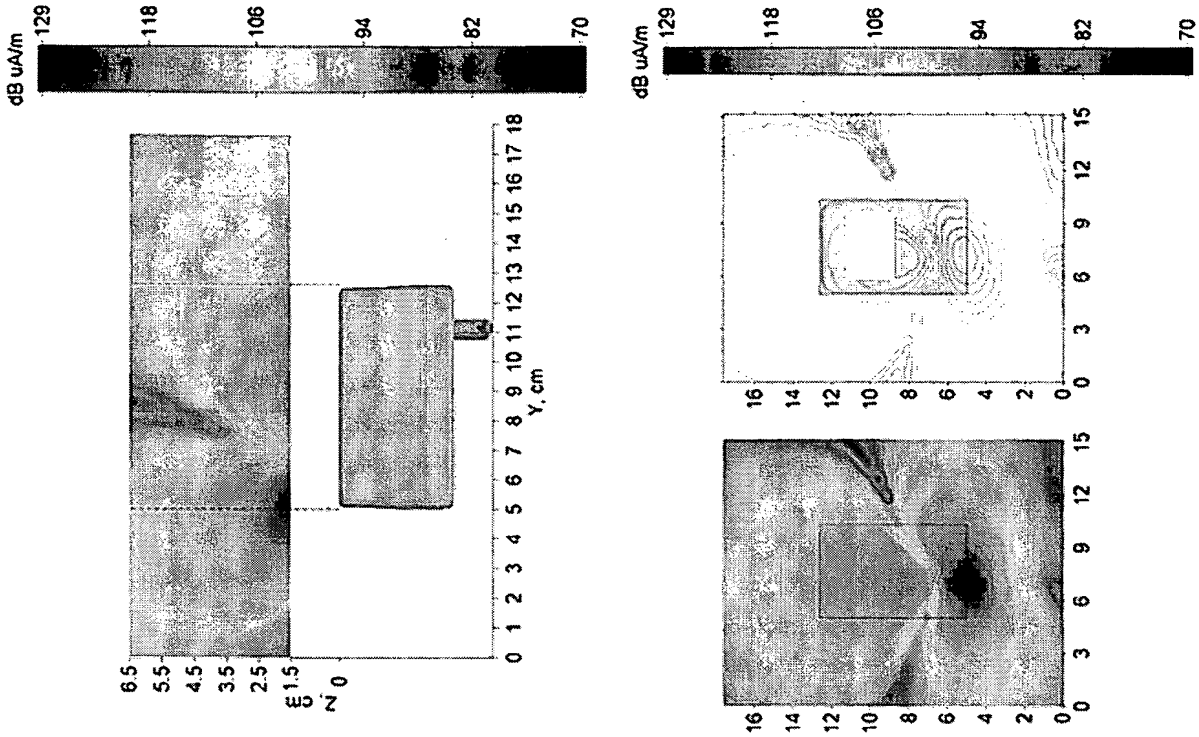


FIG. 92

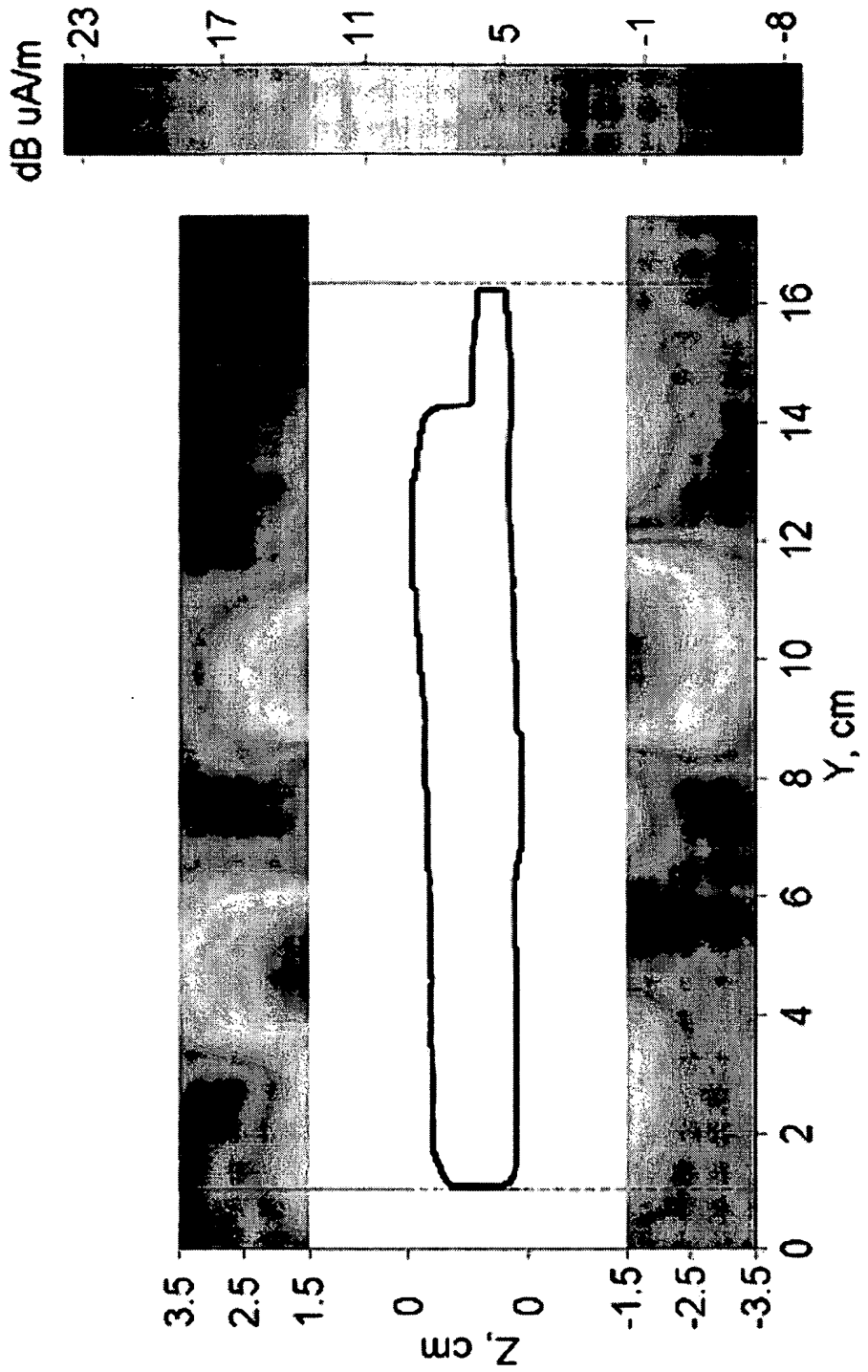


FIG. 93

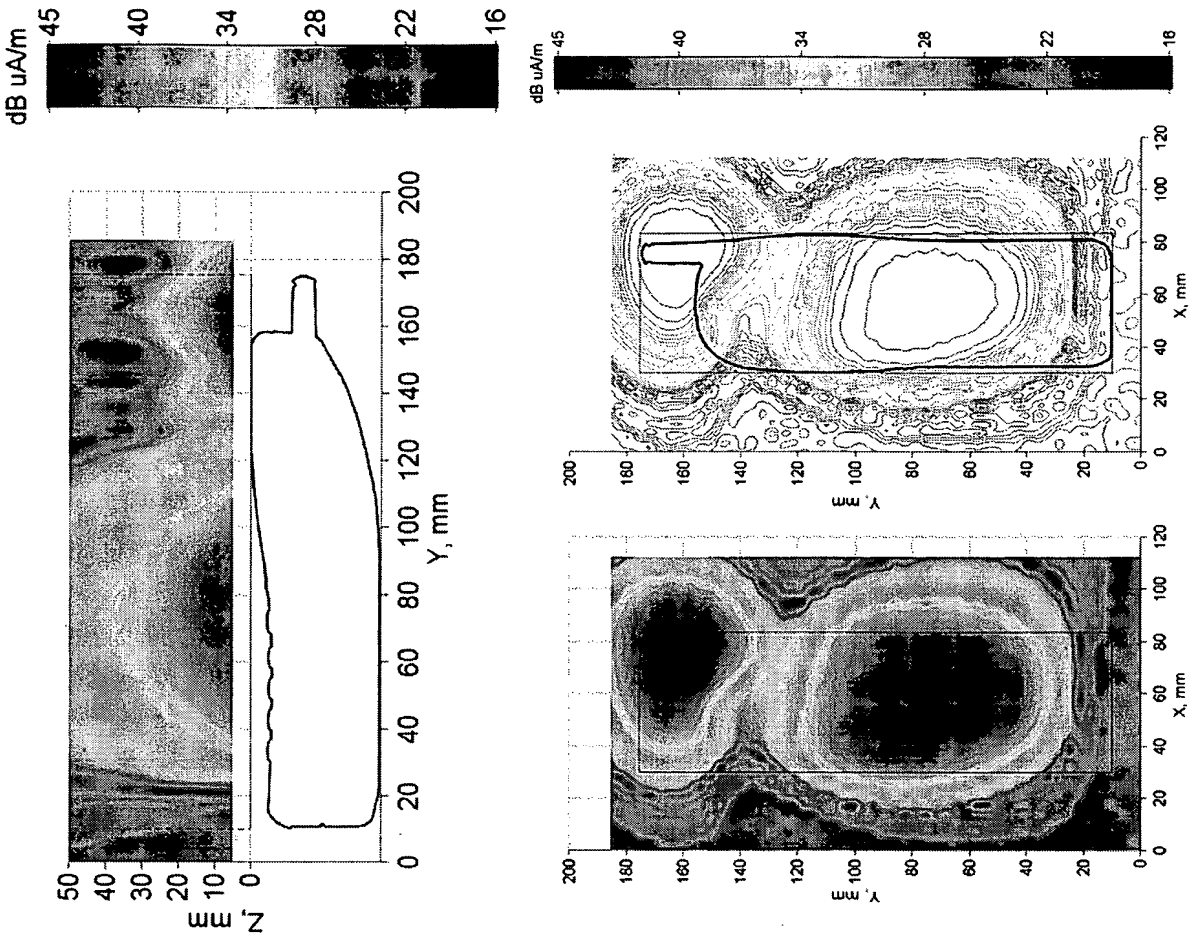


FIG. 94

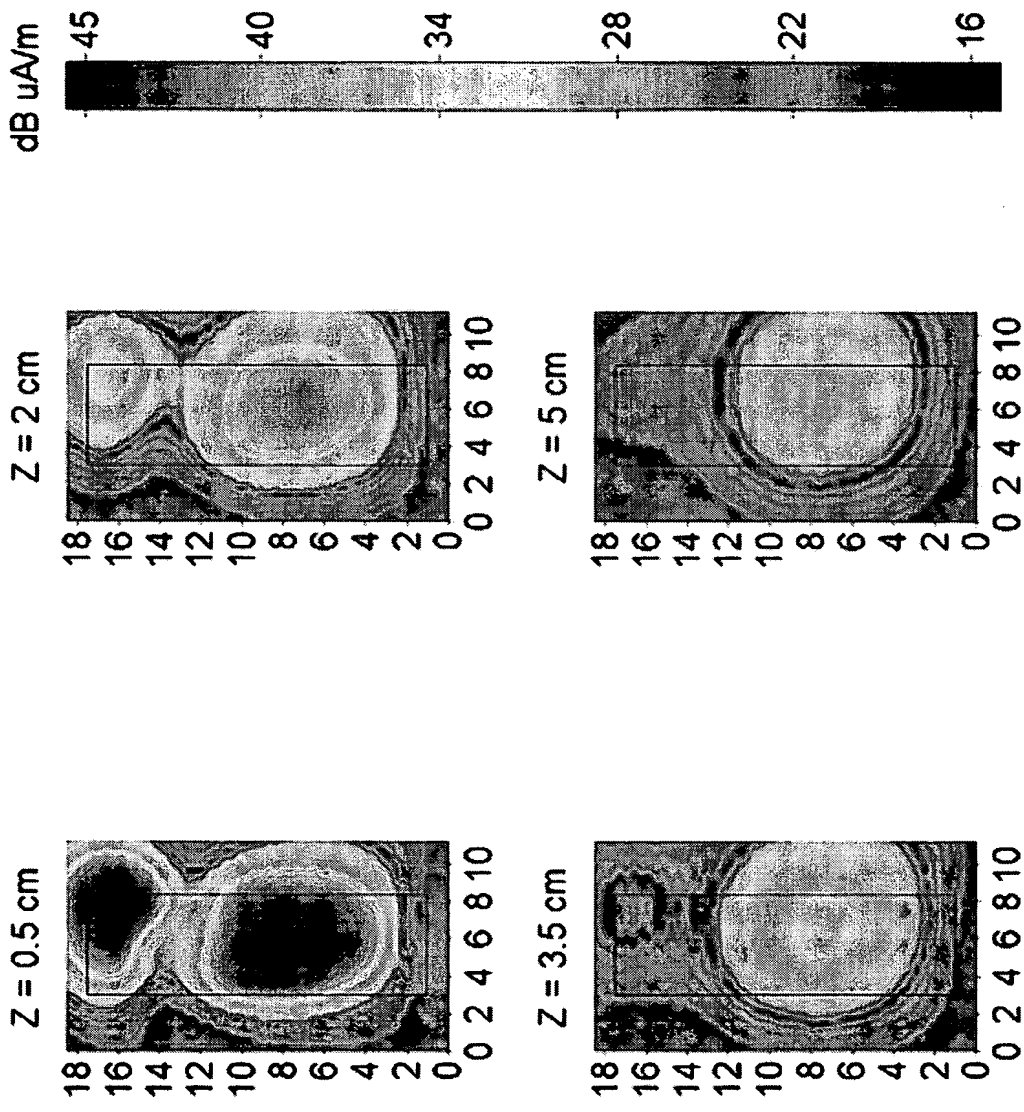

dB uA/m
45
40
34
28
22
16
Z = 2 cm
Z = 5 cm
Z = 0.5 cm
Z = 3.5 cm
0 2 4 6 8 10
18 16 14 12 10 8 6 4 2 0

FIG. 95

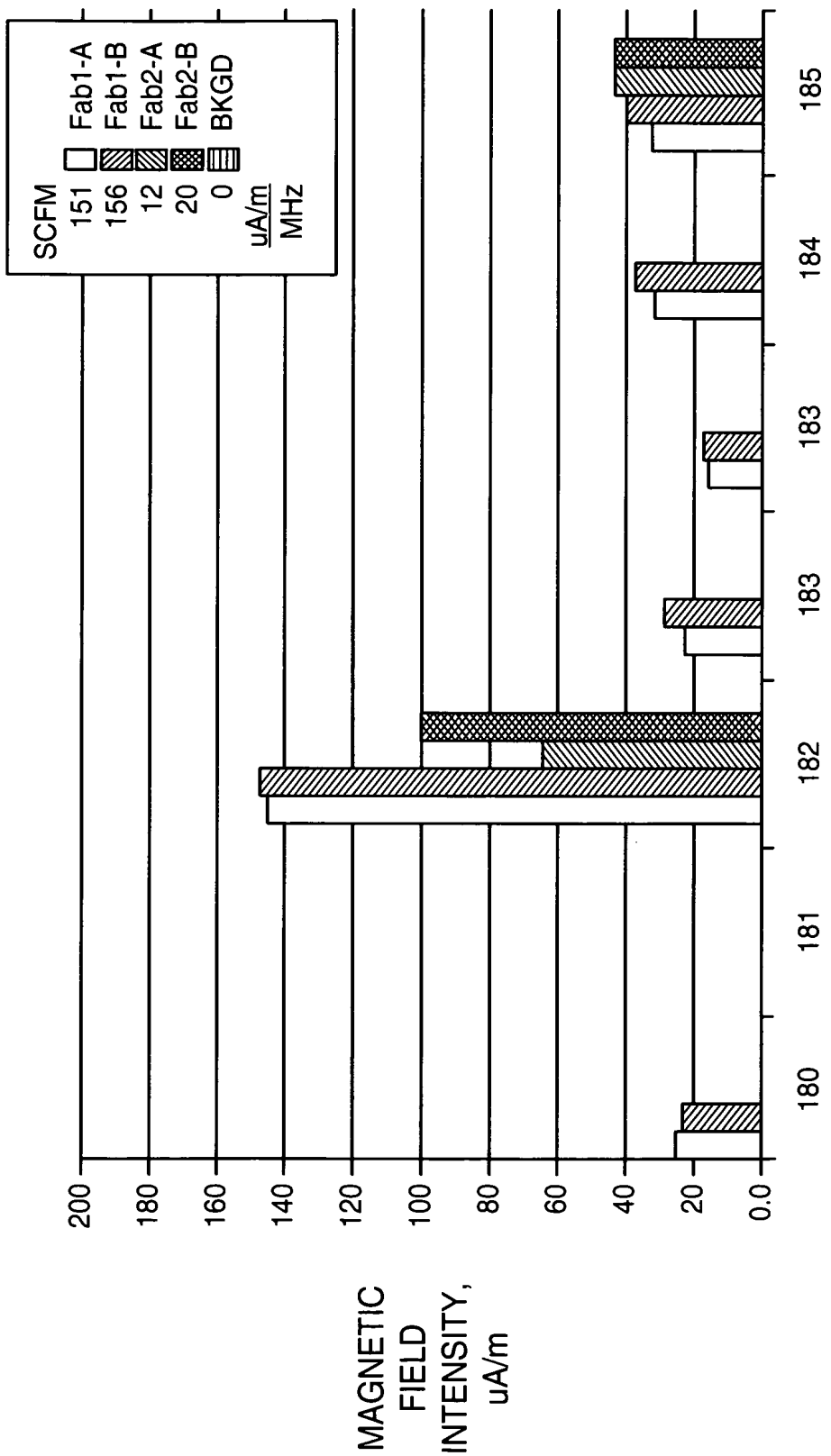

SCFM
151
156
12
20
0
uA/m
MHz
Fab1-A
Fab1-B
Fab2-A
Fab2-B
BKGD
200
180
160
140
120
100
80
60
40
20
0.0
MAGNETIC FIELD INTENSITY, uA/m
180
181
182
183
183
184
185
FREQUENCY, MHz

FIG. 96

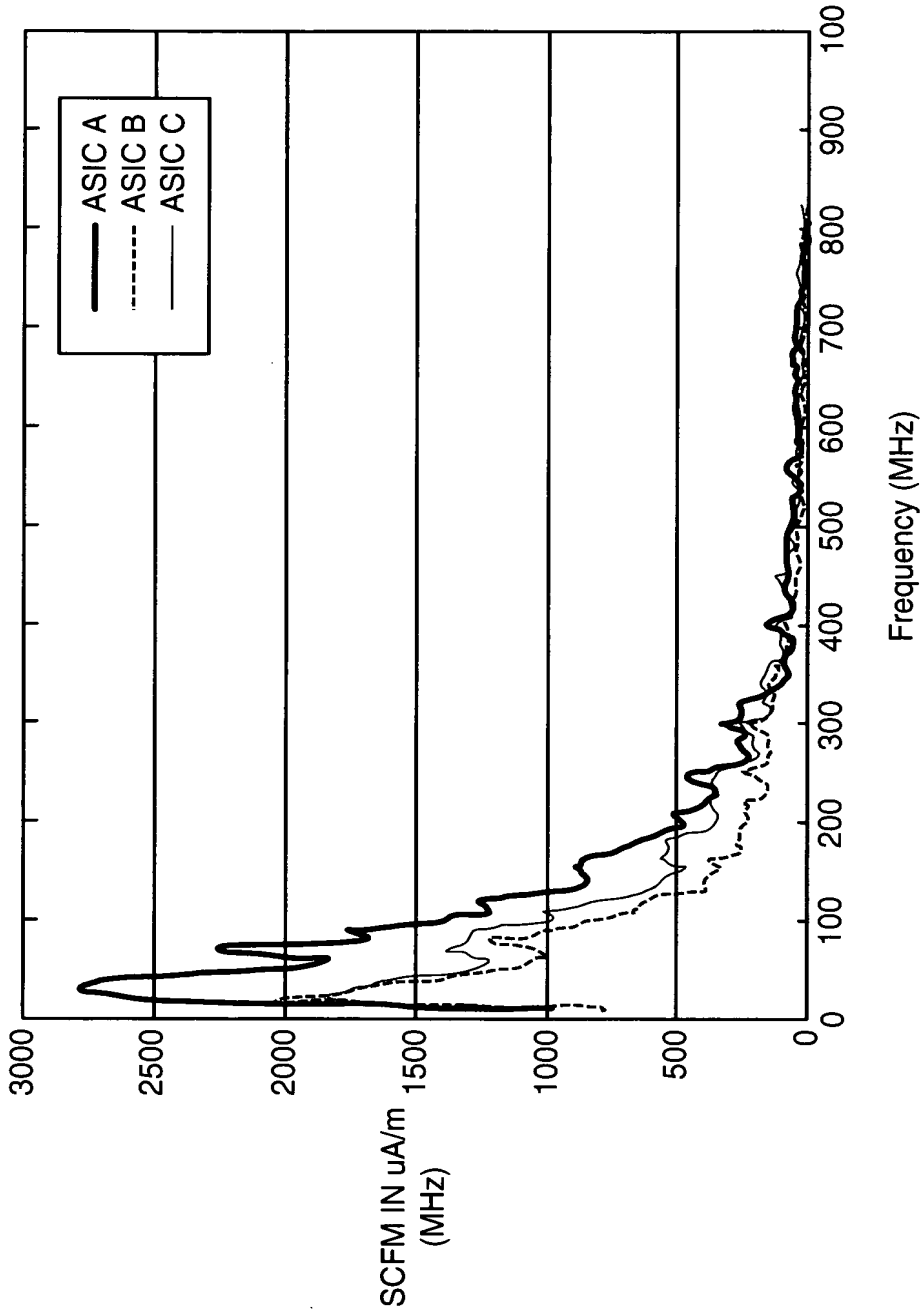

ASIC A
ASIC B
ASIC C
SCFM IN uA/m
(MHz)
Frequency (MHz)
3000
2500
2000
1500
1000
500
0
0
100
200
300
400
500
600
700
800
900
100

FIG. 97

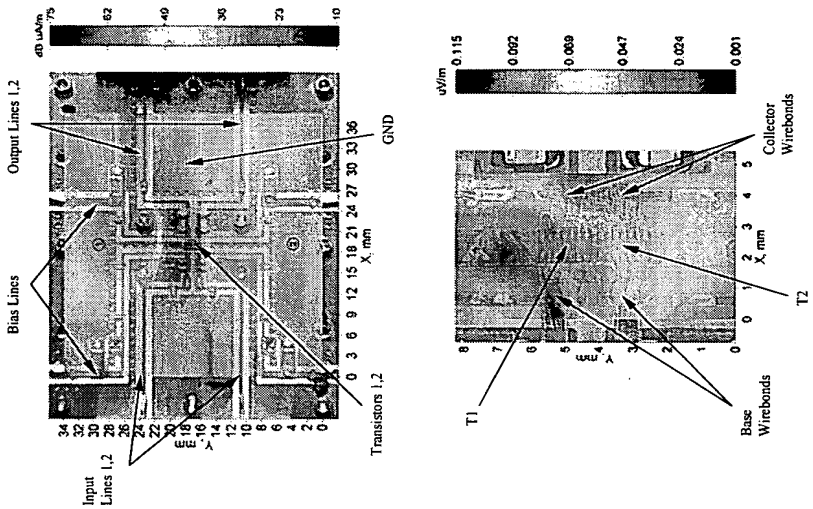

dB uA/m
75
62
49
36
23
10
Output Lines 1,2
Bias Lines
GND
Input
Lines 1,2
Transistors 1,2
X, mm
Y, mm
uV/m
0.115
0.092
0.069
0.047
0.024
0.001
T1
T2
Base
Wirebonds
Collector
Wirebonds

FIG. 98

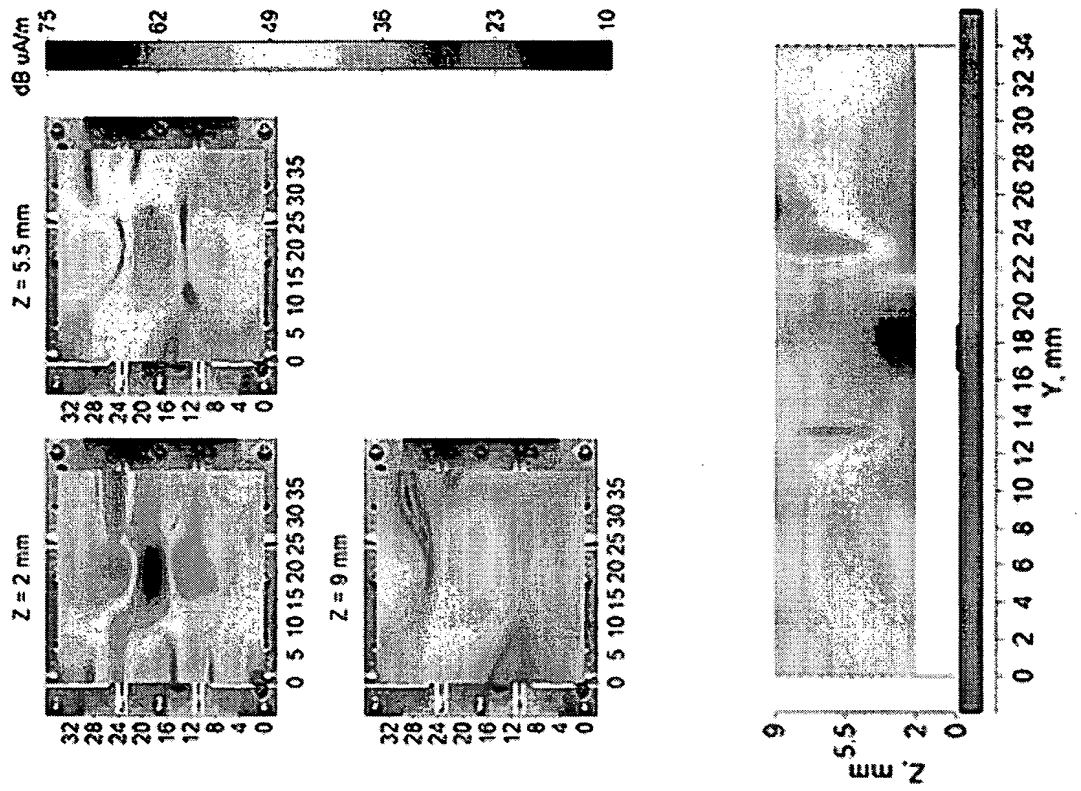

dB uA/m
75
62
49
36
23
10
Z = 2 mm
Z = 5.5 mm
Z = 9 mm
0 5 10 15 20 25 30 35
32 28 24 20 16 12 8 4 0
Z, mm
6
5.5
2
0
0 2 4 6 8 10 12 14 16 18 20 22 24 26 28 30 32 34
Y, mm

FIG. 99

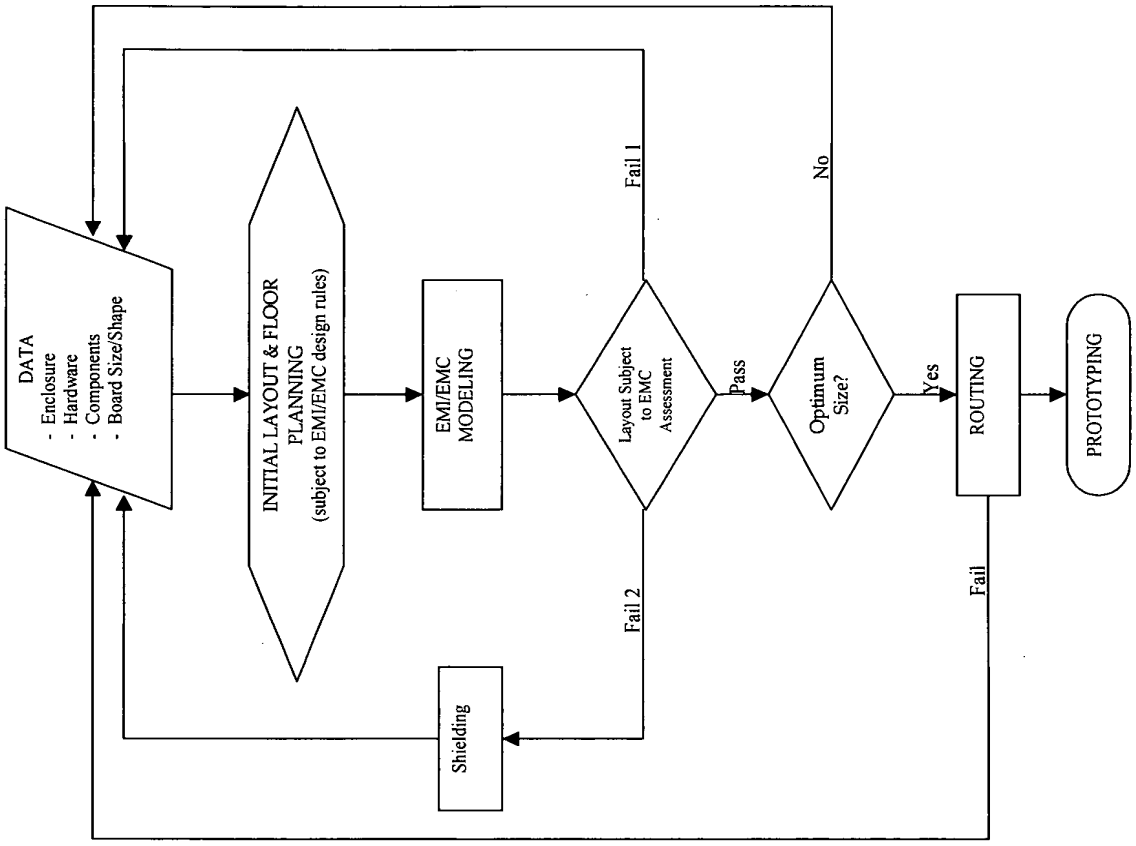

DATA
- Enclosure
- Hardware
- Components
- Board Size/Shape
INITIAL LAYOUT & FLOOR PLANNING
(subject to EMI/EMC design rules)
EMI/EMC MODELING
Layout Subject to EMC Assessment
Fail 1
Pass
Optimum Size?
No
Yes
ROUTING
PROTOTYPING
Fail 2
Fail
Shielding

FIG. 100